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Applying Electrical Equipment to Textile Machinery

By H. W. Reding
Lockwood, Greene & Co., Inc., Atlanta, Georgia

Equipment for both group and individual drive of openers, pickers, cards, spinning frames and looms—Motor inclosures—Selection of motor bearings—Control equipment

BROADLY speaking, the textile industry includes a wide variety of machinery and processes with a consequent great diversity in the problems of applying electrical apparatus. In order that there may be no confusion, the discussion to follow will apply to plants in which the raw product is spun into yarn and woven into cloth. Finishing plants differ materially from these and motor applications in such plants involves other general principles.

Within this designated field, the motive power problem is essentially one of finding means of maintaining for each machine a uniform speed, which is the speed at which the machine will deliver its maximum production. There are in common use several systems of applying motors that more or less approach this ideal. The type of motor used, the form of control and the mechanical link between the motor and the machine are inter-related and hence must be considered together. Since the great majority of textile machines are essentially of a constant-speed, continuous-running type, the motor almost universally used is the squirrel-cage polyphase induction motor. Direct current is used to a very limited extent and is not generally suitable on account of the fire hazard. Fine lint collects on everything in a mill and sparking on a commutator would be dangerous. Such d.c. motors as are used are totally inclosed or are inclosed and ventilated from outside the room.

Various voltages are found, but that most commonly used is 550 volts.

The form of layout that most nearly approaches the ideal makes use of a motor on each machine. When the motor is properly installed, each machine will operate at a uniform speed and should produce the maximum of quality and quantity of output. Naturally this type of drive is expensive as to first cost, and to reduce this cost the small group system of drive is frequently used. With this system one motor is used to drive two or four frames for roving, spinning, and twisting, and small groups of machines of other kinds can be driven from shafting by a single motor. The system with minimum first cost is the large group drive in which one motor drives a comparatively large group of machinery through shafting. A brief discussion of these forms of drive as they may be applied in the various departments of a typical cotton mill will show how motor application problems are being solved. The majority of openers are driven in groups by one or two motors. In some cases variable-speed motors are used so that the flow of cotton from the openers

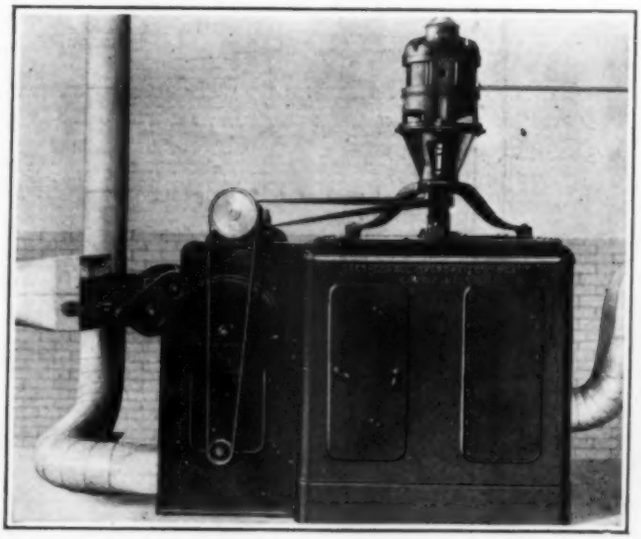
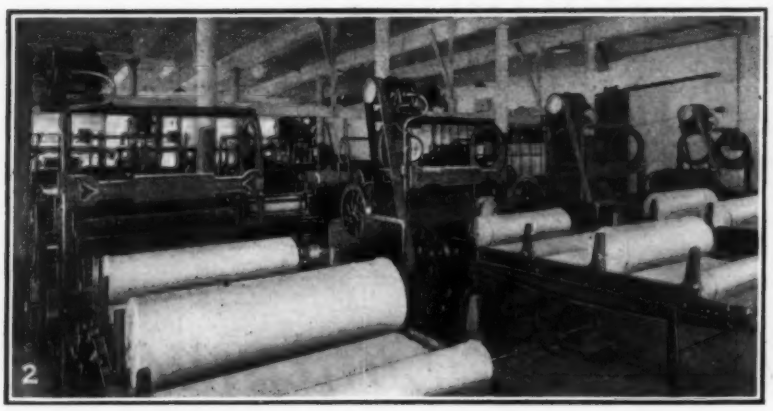


Fig. 1—Vertical motor driving an opener

A sequel article to the series, "The Application of Electrical Equipment to Production Machinery," by Robert C. Deale.



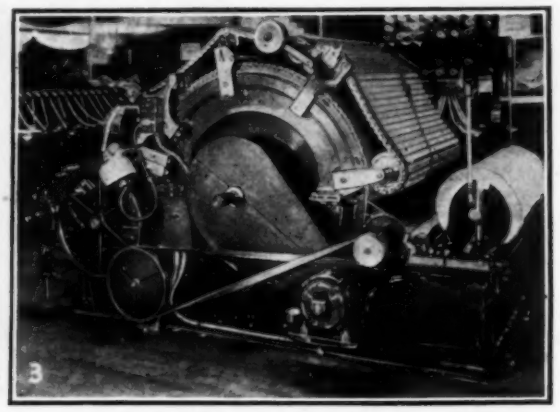


Fig. 2—Pickers driven by individual motors mounted on A-frames. Fig. 3—Motor driving card

may be closely adjusted to meet the demand for stock in the picker room. Where this drive is used, the motor is a slip-ring type with a drum controller and resistance to regulate the speed. The primary winding of the motor ordinarily will be controlled by a magnetic-type switch. In places where constant-speed motors are used, the motors are squirrel-cage type controlled by hand starting compensators.

In some cases vertical openers are driven by individual vertical motors. Fig. 1 shows a vertical motor applied to an opener.

In the picker room, individual drive is extensively used. The motors are usually installed on the A-frame with a belt drive to the machine beater shaft, but sometimes motors are hung on the ceiling. These motors are rated at 5, 7½, or 10 hp. at 1,750 r.p.m. and are controlled by magnetic-type switches. The switches may be installed in a bank on the wall with the control push button mounted on the side of the machine. This arrangement allows ready inspection of the starting equipment and removes it to a safe place, free from vibration. Fig. 2 shows a picker room in which this form of layout has been installed. As an alternate to this, the entire room may be driven by one motor through shafting or belts.

Cards are most commonly driven in groups. It is customary to use one motor for each line of shafting, thus eliminating countershaft belts. A card requires little power to drive when it is up to speed, but there is a heavy starting load due to the inertia of the moving parts. This is one of the principal reasons why group drive has been so extensively used. However, individual card drive motors have been developed. These motors are designed to carry the heavy starting load and still have reasonable running characteristics. Such a motor is mounted on a bracket on the frame of the card and drives by chain or gear to the shaft. Control equipment consists of a snap switch with a reversing switch mounted in the same case.

Cards require periodic grinding at which times the direction of rotation is reversed. The switch unit is designed so that the main control switch may be operated only with a protecting cover closed, and the reversing switch may be operated only when the cover is open and the main switch in the off position. This interlocking prevents reversal without first opening the main control switch. Cards also require stripping every few hours and it is necessary to provide a motor for the stripping brush. In some installations, there is provided a small portable motor, which may be quickly attached to the stripping brush and plugged into a convenient outlet near the card. Fig. 3 shows a motor installed on a card, and

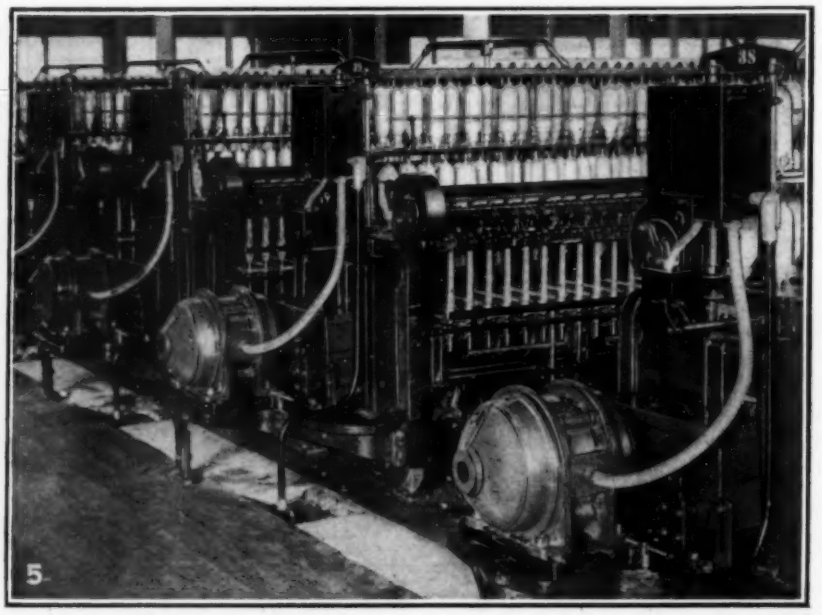


Fig. 4—Starting and reversing switch for card motor. Fig. 5—Individual spinning frame motors with chain drive

Fig. 4 shows the type of starting and reversing switch frequently used.

The selection of the proper drive on spinning frames is always important. Fluctuations in speed tend to affect the quality of the yarn, and production, up to a certain maximum, is directly proportional to the speed. Individual motor drive is ideal for spinning and is frequently found. These motors are usually rated 5 or 7½ hp. at 1,750 r.p.m. The mounting depends on the form of drive between the motor and frame shafts. With gear, chain, or direct connected drives the motor is mounted on a bracket on the end of the frame. Gear drives were the first to be used but did not prove entirely satisfactory so that very few are now in service. Silent-chain drive was next tried and is now extensively used. The centers are close, 9 to 11½ in. in most cases. Fig. 5 shows a line of individual spinning frame motors with chain drive.

In certain places, the motor is directly connected to the frame shaft. This is a fine application, since it eliminates chains and gears, but an objection is that the motor and speed of the frame cannot be changed, and the starting duty is severe on the yarn. Where certain frames may be put permanently on one class of work and where the desired cylinder speed matches a motor speed, this form of application is ideal.

In modern installations, magnetic-type switches are used for control with a master switch operated by the shipper rod of the frame. In older installations, small oil circuit breakers are used.

Recently a new type of drive has been developed known as the Texrope drive. Multiple stands of V-shaped rubber belting run on grooved sheaves. This form of drive allows the motor to be placed on the floor so that no bracket is necessary. Special sliding bases are supplied so that the drive may be tightened. Needless to say no lubrication is required with rubber belts. The efficiency of this drive is slightly less than that of a chain drive, but the difference is not of great importance. The installation is simplified and the need of accurate alignment is obviated. Another advantage of this form of drive is the elimination of the starting jerk. The belts will slip slightly at the instant of starting, and the frame will come up to speed without appreciable strain on the cylinder and bearings. It is claimed that when the belts are properly tightened there is no appreciable slip and this is, of course, the primary consideration. Present installations are proving satisfactory. Fig. 6 shows such an installation with the guards removed.

Another commonly used drive for spinning frames is known as the four-frame drive. The motors are arranged with special shaft extensions carrying four pulleys, which drive by belt to the frame pulleys. Figs. 7 and 8 show

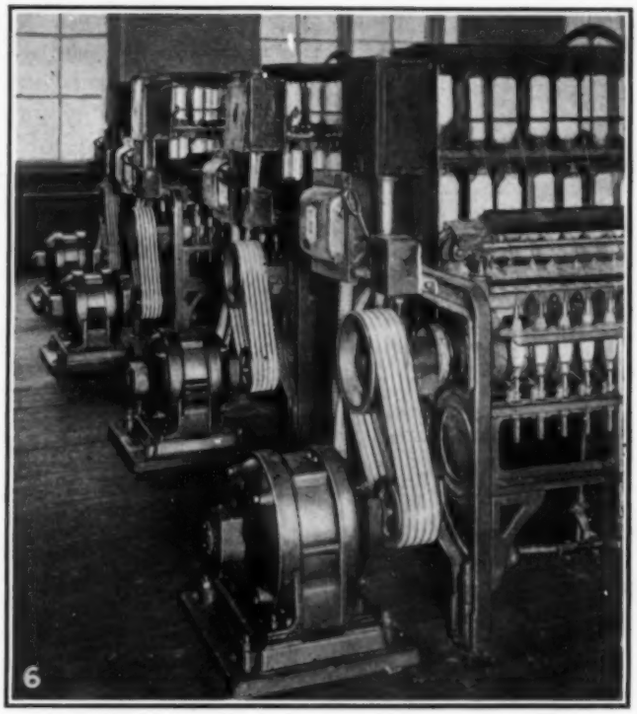
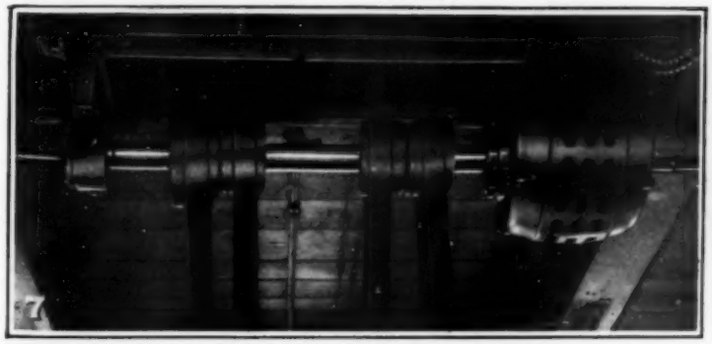


Fig. 6—Texrope motor drive applied to spinning frames

two commonly used types of four-frame motors. The tendency is away from this drive in most modern installations. This drive is simpler and less expensive than the individual drive, but the factor of variable belt slip, and hence variations in speed, is introduced, which is objectionable.

In addition to these forms of drive, large group drive is used. Speed fluctuation is increased, owing to the greater number of belts between motor and machine and there are other disadvantages. Large group drives are installed only where first cost is the controlling factor.

In many respects the motor applications to roving frames are similar to those to spinning frames. However, individual drive is used to a much smaller extent. The earlier application of individual motors were not entirely satisfactory, since there was no switch that would stand the frequent starting and stopping duty. Magnetic switches have now been improved and made available for such use and this difficulty has been overcome. Some modern drives make use of a clutch between the motor and the machine, operated by the shipper rod of the frame. Four-frame drives are extensively used. The motors run at lower speed than those for spinning frame drive since roving frames themselves run at a relatively low speed. Motor speeds of 600, 720 and



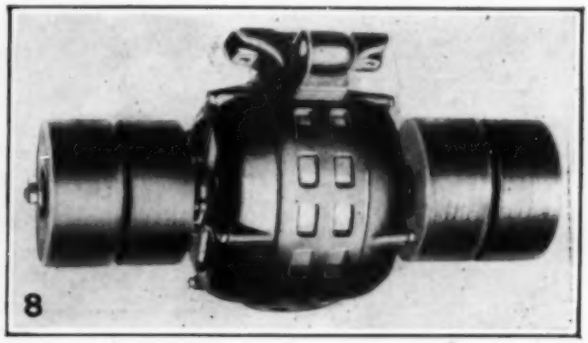


Fig. 7—Four-frame motor drive for spinning frame. Fig. 8—Typical double extended-shaft type of four-frame motor

900 r.p.m. are usual so that it is possible to obtain reasonable pulley ratios and hence more satisfactory belt drives.

A loom is a machine that is sensitive to speed fluctuation. There is for each loom a correct speed and small changes up or down are noticeable. High production and good quality depend on a uniform and a correct speed.

Individual drive most nearly fulfills these conditions and is extensively applied. The motors are usually small and are totally inclosed. They are mounted on a bracket on the loom and drive by gear. The motor runs continuously and is connected to the loom mechanism through a clutch. This arrangement allows the use of a motor with low starting torque and consequently of high efficiency and power factor.

Loom motors are usually controlled by snap or toggle switches, and overload protection is provided by thermal cutouts in the switches. These are mounted on pedestals on the floor.

In Fig. 9 is shown a typical individual loom motor. It is customary to have the motor leads 4 ft. long as the motor is within this distance of the switch and long leads eliminate the need of a junction box on the motor. Fig. 10 shows a loom-motor switch and pedestal.

Looms driven by individual motors differ in some respects from those arranged for belt drive, consequently this form of drive is very seldom applied to old looms. Practically all individual-drive installations are made in connection with new looms. Group drive is used when applying motors in a weave room where the looms were originally driven by an engine and where new machinery is not installed. The use of one motor for each line of shafting eliminates counter belts and in a great many cases chain or Texrope drives are used between the motor and shaft. Both drives give a uniform shaft speed and the only chance for slip is in the belt to the loom.

General Features

A textile mill is inherently a dusty place and the amount of lint and dust in the air depends on the quality of the stock being run. There is some difference of opinion whether to place screens on the openings of the motors or to omit them. The screens prevent the entrance of most of the lint, since it is collected on the outside of the screen, but this material, unless frequently removed, tends to cut down the supply of ventilating air. This condition, however, is not serious. The worst feature in connection with the use of screens is that some lint gets inside and cannot readily be removed. Where screens are omitted and the motors is designed with no restricted ventilation passages, lint enters freely and the greater part is blown through. The open construction makes it comparatively easy to blow out the motor periodically with compressed air. All manufacturers now build motors with relatively open passages and a great many motors are now installed without screens. Where screens are used, all motors should be disassembled and thoroughly cleaned at least once a year.

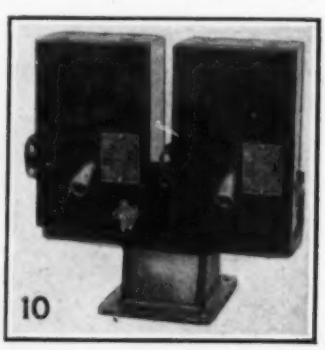


Fig. 9—Typical loom motor. Fig. 10—Pedestal type of starting switches for loom motors

As mentioned above, loom motors are totally inclosed. Large motors of this type are not used, since the cost is now approximately twice that of an open motor. Improvements in design are being made, however, and without doubt the cost will be brought down. This reduction should result in an increase in the use of totally-inclosed motors.

The question of lint brings up another controversial point—that regarding motor bearings. With the ordinary sleeve bearing there will usually be oil on the outside of the motor and what is much worse, oil on the windings. In many mills oiling is done on the theory that if some oil is good, more is better, and consequently bearings are over filled. Ball or roller bearings, on the other hand, are lubricated with grease and require attention only about twice a year. They undoubtedly reduce the amount of lubricant which gets outside the bearing housing and as a consequence are being used somewhat extensively in new installations. This feature is the greatest one to be claimed for anti-friction bearings in this field. The saving of power due to decreased friction loss is not appreciable.

Waste-packed bearings have frequently been used on certain types of textile motors, such as the one shown in Fig. 9. Where the motor is subject to vibration, there is the possibility that oil rings will not properly lubricate the bearings at all times and for this reason waste-packed bearings have been applied. With the improvement of oil-ring, sleeve bearings and the growing use of anti-friction bearings, this type is less frequently specified on new installations.

As has been outlined above, the motor control equipment used is comparatively simple. In general, it may be said that motors up to 3 hp. have heavy-duty snap or toggle switches with thermal cutout protection. Motors of 5 and 7½ hp. or larger with a very light starting load use magnetic switches. Motors over 7½ hp., and sometimes smaller, when the starting load is heavy, are equipped with hand-starting compensators. With this equipment, all motors have overload protection and those with magnetic switches and compensators have undervoltage protection as well. Where a large group of small motors with snap switches is used, such, for instance, as in a weave room with individual drive, it is customary to provide a magnetic switch for each circuit of motors. When properly laid out, this arrangement gives a double advantage. It provides undervoltage protection and allows motors to be started in groups.

The rapid growth of electric power in textile mills proves beyond a doubt that properly-applied motors materially increase manufacturing efficiency. The textile industry was large and well established before motors were invented and now a large proportion of plants formerly driven by engine or waterwheel have changed to electric drive. It is also interesting to note the trend toward individual drive. Twenty years ago the average size of motor sold for use in textile plants was about 35 hp. and today it is probably 5 hp. or less. This shows the tendency to apply a type of electrical equipment that makes possible the greatest utility from the productive machinery.

A Simple Maintenance Cost System

By CHAS. M. ROSE
Superintendent Engineering Maintenance, Standard Printing Co.

Mechanical maintenance records in plants producing non-mechanical products can be kept at slight expense, and give a true working basis for machine replacement

A SIMPLE maintenance cost system, which gives detailed costs of all mechanical upkeep in the plant, at the same time giving an exact record of the performance of each machine, is in operation at the plant of the Standard Printing Co. This system does away with haphazard methods of maintenance too frequently practiced in plants not turning out a mechanical product, and gives the plant engineer complete control at all times over the maintenance work. It was found in this particular factory that the plant maintenance work totaled nearly 2,000 separate jobs in a year, amounting to approximately $26,000 annually for mechanical repair work. By inaugurating this maintenance cost system, a separate check could be kept on the repair work. The actual time required for keeping up this cost system is claimed to be not over twenty minutes per day. In Fig. 1 is shown an inspection card, which is one of the important elements of the system. There is one card for each machine in the plant, and a designated number of cards are given each day to the inspector, whose duty it is to inspect machines bearing the numbers on the cards, and to report on their condition. If the machines are in first-class operating order, he makes a record to that effect on the card. If, however, a machine needs repair, he notifies the foreman of the department immediately to issue a maintenance order. The front and reverse sides of this maintenance order are shown in Figs. 2 and 3. The maintenance order may also originate from the foreman in case of a breakdown between inspections. The maintenance order containing instructions for the repair, and signed by the foreman of the department, is sent to the superintendent of engineering and maintenance. It is then given an order number, outside purchase orders for material are issued on its authority, and a complete record of the time and material spent on the job is kept on the back, as shown in Fig. 4.

THE STANDARD PRINTING CO.
Department of Engineering and Maintenance

Date June 6 — No. 850

MAINTENANCE ORDER

Remarks and nature of work; also cause necessitating repair	REPAIRS	EQUIPMENT	STOCK	JOB TICKET No.
Install new drive shaft Shaft twisted due to being frozen in bearings Lack of proper lubrication	✓			

Machine No. 91
Kind of Machine Power Press
Part Main drive shaft
Floor 4
Department Engraving
Operator S. Thomas
Order Issued by C. Jones.
Date of Inspection June 5-26
Inspected by Con Rose
APPROVED Chas M. Rose
Accounting Dep't Posted BR.

Fig. 2—Foreman's order for machinery repair

Floor 4 — Dep't Engraving — INSPECTION CARD — No. 91

MACHINERY DIVISION
Department of Engineering and Maintenance

DATE	O. K.	Insp. By	Job No.	Cost Maint.	DATE	O. K.	Insp. By	Job No.	Cost Maint.
April 2	✓	WS							
15	✓	WS							
May 1	✓	WS							
10	✓	WS							
June 6			850	10.28					

Fig. 1—Machinery inspection card

MONTH OF June — DEPARTMENT Engraving — E AND M DEPARTMENT ORDER SYSTEM

M. O. NO.	✓	PURCHASES	MATERIAL	LABOR	O.H.	TOTAL	
848	✓	3 06		5 30	1 40	9 76	
849	✓		20	1 00	20	1 40	
850	✓	3 06	52	5 30	1 60	10 28	OK
TOTAL							

Fig. 3—Maintenance repair charge card

DETAIL COST SHEET

DATE	EMPLOYEE	TIME	RATE	AMOUNT	MATERIAL AND EXPENSE	
June 6	Horn	2	80	1 60	Purchase Order No. 9899	
" 7	Brunnel	½	40	20	L. S. Brown Supply Co.	
" 7	Hilroot	1	75	75	5¼ lbs Shafting @ 06 5×1 11/16	3 00
" 7	Whistler	1	75	75		
" 8	Horn	2½	80	2 00		
					2 Set Screws ⅜×½	12
					1 Key	40
					Labor	5 30
					Extras	
					Overhead	1 40
		7 hrs @ .80		5 30	TOTAL	10 28

Fig. 4—Reverse of repair order

A simple tickler card is also kept in the engineering and maintenance department, on which a record is kept of all orders in sequence of issue, so that they may be traced at any time. In the same department a card is kept for each separate department of the plant, on which a record of all order numbers charged against that department is kept. This card is shown in Fig. 3. On it is entered the cost of the repair order, so that the repair bill of any department is available at any time. The repair bills against each department are balanced and compared each month. The inspection card, Fig. 1, shows at all times the repair cost against each separate machine. With this system it is possible, therefore, to know at any time the cost of upkeep of any department or of any separate machine, which information is valuable in determining replacement. While the system shown was laid out for a printing plant, it can be applied directly to the mechanical maintenance work in almost any type of industrial plant.

Railroad Rewards Cleanliness

IN ORDER to promote cleanliness, the management of a well-known railroad shop has directed that the placard shown in the illustration be awarded each week to the operator having the cleanest machine.

The winner is selected by representatives of the machine-, boiler- and electrical-shops, who make inspection tours at various intervals. The placard is placed on the winner's machine, being emblematical of the award.

The operator of the cleanest machine gets this placard

Seen and Heard

By John R. Godfrey

Reliability and what's behind it

COLONEL LINDBERGH'S flight to Paris brings up a train of interesting thoughts and recollections. Without disparaging those who followed, the lone flyer's business like methods, his remarkably accurate navigation and his dependence on scientific instruments instead of rule-of-thumb guesses, makes him an outstanding figure. And who remembers the man who followed Columbus?

The flight itself recalls early experience with internal combustion engines. They were more or less mysterious mechanisms in those days. Steam engines were understandable to the average laymen, but the "gas" engine ran more or less spasmodically, and not always with rhyme or reason. When an engine was completed we all hoped it would run, but we wouldn't have bet on it very heavily. It was sort of an act of Providence, when, and if, it started the first time. Years afterwards, it was startling to see car after car in the Ford assembly line, start, one after the other, without a hitch.

Not only does the modern "gas" engine start without difficulty, but it keeps on running, usually as long as the fuel lasts. The trans-oceanic flights have done much to prove the reliability of the gasoline engine. With careful construction and proper attention it runs till fatigue causes failure of some part. Improved metals and increased accuracy of manufacture have made the gasoline engine as reliable a piece of mechanism as can be found anywhere.

It is quite probable and not at all unnatural, that the gas engine men think all the improvements are due to their cleverness in design. But, while I hand them a lot of credit, it's a safe bet that all the improved "doodads" and "dinguses" wouldn't have made the modern gas engine what it is without the improved machine tools that made more accurate work possible.

Just to get a correct slant on this it is well to hark back to the early days of the steam engine. The idea of the steam engine was fairly well advanced long before there was any way to build it sufficiently accurate to work at all satisfactorily. There's a story to the effect that when a cylinder was bored so round that a rule could not be pushed between the piston and the cylinder walls, it was called a good job.

Just contrast this with the accuracy of the cylinders of a modern automobile engine—regardless of the price. And compare these cylinders with the same make of cylinders of ten years ago. Accuracy as to roundness and straightness, not to mention the smoothness of the cylinder walls, has improved almost beyond belief. And this improvement is due entirely to the advances made in machine tools. With all due respect to the designers of the engines that are performing so satisfactorily, their wonderful success could not have been achieved without the modern machine tools and the men who operate them. These are the things behind the flights.

The greater the development of machinery to do the work formerly done by man, the greater has been the prosperity of the workman and of the country.

Reconditioning Locomotives with Modern Equipment

By FRANK W. CURTIS
Western Editor, American Machinist

Tool for trepanning connecting rods—Boring fixture for eccentric rods—Lapping device for fitting piston rods to crossheads—Laying out a crosshead

REALIZING that efficient tools play an important rôle in motive-power maintenance has led the Chicago, Burlington & Quincy R.R. to equip its Denver shops with such devices as will aid in handling repair work economically. An example of a time-saving device is the connecting-rod trepanning tool illustrated

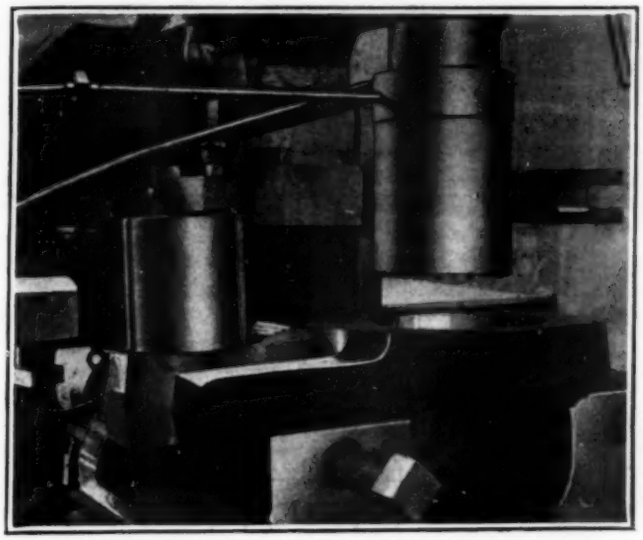


Fig. 4—Trepanning the back end of a main rod

in Fig. 4. The work shown is the back end of a main rod of the floating-bushing type, being trepanned to 9 in. in diameter. Prior to using the tool three 1⅛-in. clearance holes are drilled in the path of the cutting tools to facilitate chip removal. The depth of the cut is 8 in., and by operating the tool at 28 r.p.m. and at 0.016 in. feed per revolution, the core, shown on top of the work, is cut out in 18 min. The operation is handled in a Baker drill press.

Constructional details of the tool are shown in Fig. 5. The body, made of steel, is turned on the driving end to receive the lubricant ring *A* that has an annular groove cut in it opposite the pipe connection. In operation, the ring remains stationary as the body revolves. The cutting compound enters the body through four holes, as at *B*. The open body carries twenty-four cutters, and between them a similar number of holes *C* are drilled, so that the cutting compound will reach the cutters. This feature permits the chips to be washed through clearance holes and eliminates the necessity of relieving the tool at intervals, as is generally required in trepanning thick work. At *D* is illustrated the method of grinding the cutters. The cutters have $\frac{3}{16}$-in. cutting faces, arranged in four sets of spirals so that the width of the cut is divided in four parts, each of which has six steps. An enlarged view of one of the cutters is given at *E*.

Another operation performed on the same machine, illustrated in Fig. 6, is the boring of an eccentric rod. The rod is drilled to ⅝ in., then to 3½ in., after which it is bored to 4 in. in diameter in two cuts, by the boring bar shown. The work is 3-in. thick at the point bored. The fixture is made in three parts, in two of which the rod is clamped by its central portion. The other part is U-shaped and holds the end of the rod centrally, adjustment being made by two setscrews. The lower end of the machine spindle is supported and guided by a bushing in a bracket attached to the column of the machine.

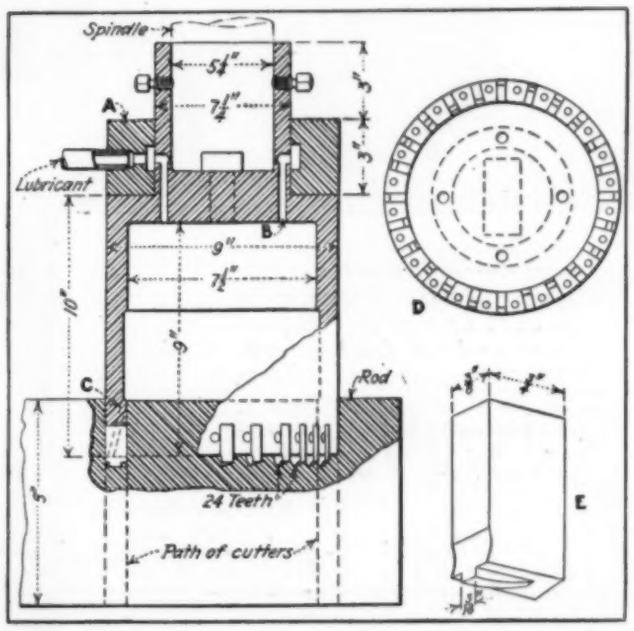


Fig. 5—Details of the trepanning tool

The second article. The third will appear in an early issue.

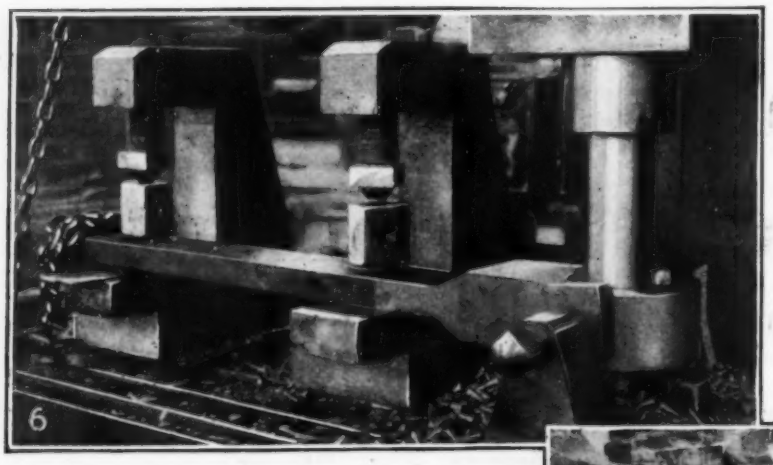


Fig. 6—Boring the end of an eccentric rod. The rod is drilled from the solid to 3½ in. in two operations. The opening is then brought to size by boring. The thickness of the part bored is 3 inches

Fig. 7—Stands for supporting connecting rods. Where hand work is necessary in fitting up connecting rods, they must be supported so as to be accessible from all sides. The stands are made from 1½-in. pipe, and are adjustable for height

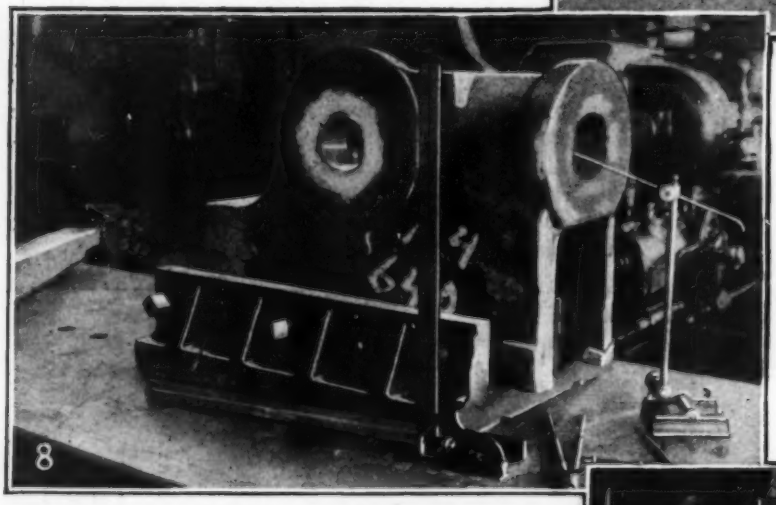


Fig. 8—Laying out a crosshead. Crossheads are laid out so as to be sure that all parts to be machined will have sufficient allowance for the cuts. At the same time the keyslots are laid out

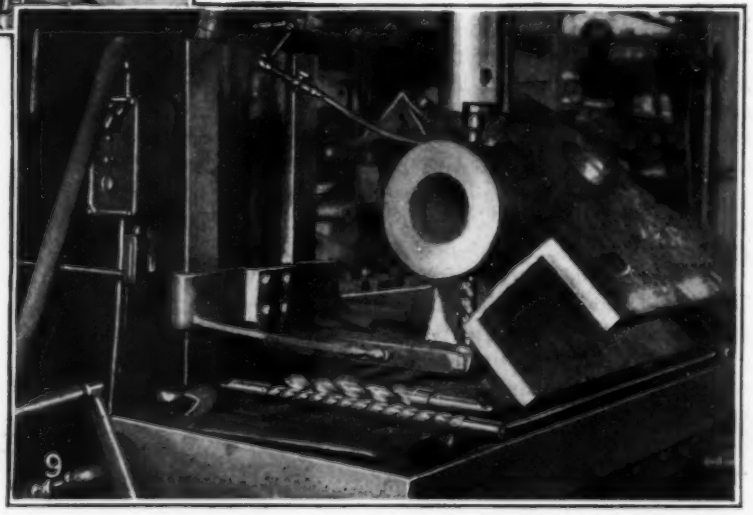
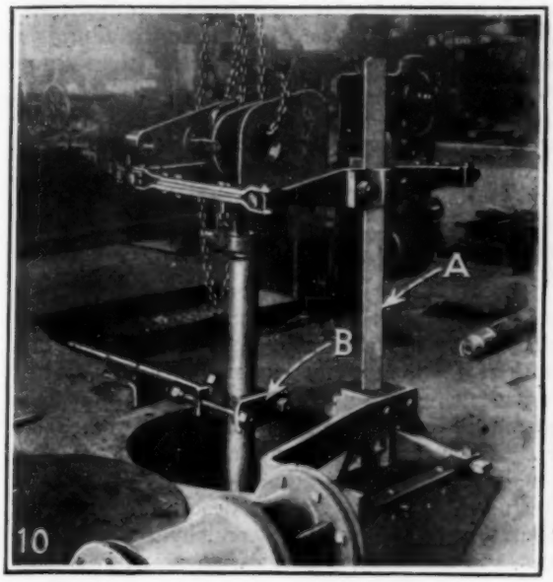


Fig. 9—Milling the keyslot in a crosshead. So that the key for attaching the crosshead to the piston rod can be driven in or out after assembly in the engine, the slot in the crosshead is milled at an angle of 45 degrees



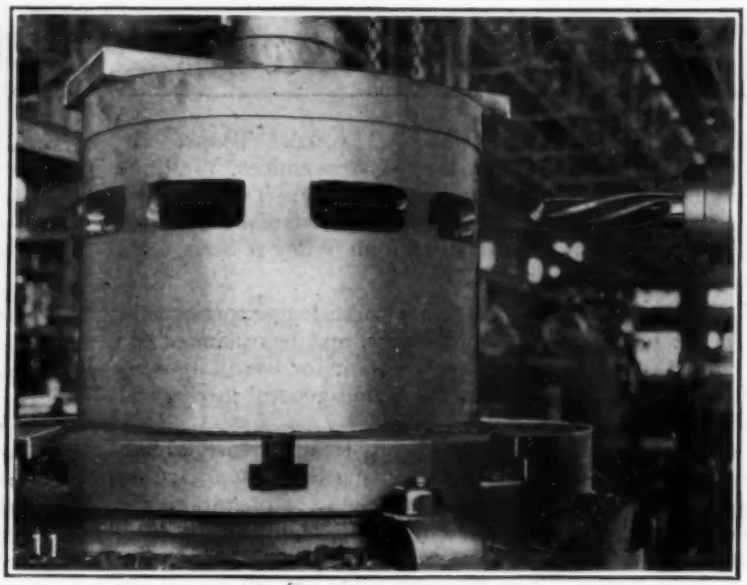


Fig. 10—Lapping device for piston rods and crossheads. Fig. 11—Milling port holes in a valve bushing

Rods requiring miscellaneous bench-operations are placed on stands such as the ones illustrated in Fig. 7. The supporting arms are adjustable for height and they can be locked in the desired position. The stands are built of 1½-in. pipe.

Crossheads are laid out on the plate shown in Fig. 8, prior to being machined. The work is clamped in the fixture by six setscrews, then carefully marked off so that the proper amount of stock will be allowed around the holes. Keyslots are laid out at the same time to insure proper alignment. The crosshead and fixture assembly are then transferred to the boring mill. The pin holes are bored and then faced on their inside surfaces; after which the fixture is turned 90 deg., for boring the piston-rod hole.

After the holes have been completed, the work is removed from the fixture and is clamped to the 45-deg. fixture, as illustrated in Fig. 9, where the keyslot is machined. A strap clamp, located on the inside of the work, is used for clamping. The bottom edge of the work rests on the machine table. A ⅞-in. hole is drilled through the rod boss, after which a helical cutter is inserted as shown. A bracket, fastened to the machine column, and having a bushing at its outer end, supports the lower end of the cutter. The table is fed by hand, and the cutter is operated at 200 r.p.m. A keyslot is completed in 30 min., floor-to-floor time.

Piston rods and crossheads are fitted together by the lapping device illustrated in Fig. 10. The device is air operated, being driven by a 9-in. cylinder taken from the steam end of an obsolete air pump. The piston rod is stood on end and rests on a block in the bottom of a round pit. The crosshead is suspended over the piston rod by a chain block and is oscillated by the piston in the air cylinder, through the vertical shaft *A* and suitable connections. The piston rod is prevented from turning by the clamp *B*. After abrasive compound has been applied, the crosshead is lowered on the piston rod, and oscillated thereon. A setscrew, fastened in a block connected to the crosshead, and striking the upper end of the piston rod, is used to regulate the lapping pressure between the two parts. The crosshead is oscillated 85 times per min., producing a completed joint in 20 min. The pit is covered when the device is not in use.

Valve-bushing port holes are finished to size in a milling machine. The bushing shown in Fig. 11, clamped to the rotary table by a strap clamp, is fed in to the end mill. It is then given the necessary vertical and rotary motions to finish the holes to size. A 1¼-in. diameter cutter is used. The bushing shown has ten 1⅝x3¾-in. port holes, and the work is completed in 20 min., floor-to-floor time.

Errors Due to Misunderstandings

MORE costly errors are probably caused by misunderstandings than by carelessness or unskilled workers. Instructions are not always clear to the men doing the job and drawings are too often open to two or more interpretations. Then, too, definitions are not sufficiently standardized to have them mean the same in all localities.

Even the terms "tolerances," "limits," "allowances" and "clearance" are used in great confusion by many who fail to have their exact meanings. The definitions of these terms decided upon by the Plain Gage Committee of the American Society of Mechanical Engineers are the acknowledged standards in this country.

The sooner all become familiar with these terms the better for all concerned. The definitions are:

Nominal Size. A designation given to the subdivision of the unit of length having no specified limits of accuracy but indicating a close approximation to a standard size.

Basic Size. The exact theoretical size from which all limiting variations are made.

Allowance. (Neutral zone). An intentional difference in the dimensions of mating parts; or, the minimum clearance space which is intended between mating parts. It represents the condition of the tightest permissible fit, or the largest internal member mated with the smallest external member. It is to provide for different classes of fit.

Tolerance. The amount of variation permitted in the size of a part.

Neutral Zone. (See Allowance.)

Limits. The extreme permissible dimensions of a part.

Book Reviews

THE CARE AND OPERATION OF MACHINE TOOLS. By J. W. Barritt, Supervisor of Apprentices, Westinghouse Electric & Manufacturing Co. Two hundred ninety-two pages, 6x9 in., cloth boards. Indexed. Illustrated. Published by John Wiley & Sons, Inc., New York. Price $2.75.

THE author of this book has had a long experience in the instruction of apprentices, and has planned the volume as a text and reference book for use in apprentice courses and in trade schools and general mechanical courses.

The idea behind the book is to treat on each of the machine tools in common use in machine shops, taking up the uses of the tool, the principles of operation, the various mechanisms, working tools, and attachments, together with observations on the care and proper use of the machine. The machine tools treated separately are: The drill press, shaper, vertical and horizontal boring mills, lathe, planer, and milling machine. In addition, a chapter is devoted to the principles and practice of lubrication, and another chapter takes up the subject of grinding wheels.

In each case the author explains the layout and set-up of work for the machine under discussion, and the proper selection of tools. The various cuts, feeds, and speeds are also discussed, and instructions are given for the best care of the machine. Each subject is well illustrated with pictures of the machine and important parts, and line drawings of tools and set-ups. The entire book is well arranged to meet the needs of the apprentice or young machinist.

THE FATIGUE OF METALS. By H. F. Moore and J. B. Kommers. Three hundred twenty-six pages, 6 x 9 in., cloth-board cover. Published by the McGraw-Hill Book Co., 370 Seventh Ave., New York, N. Y. Price $4.

DURING the past quarter century, the use of high-speed machinery has increased so rapidly that the knowledge of the behavior of materials, chiefly metals, under repeated stress has become a necessity since failure of such materials occurs without warning and, in many cases, is the cause of serious disaster. To this end the authors summarize the more important facts concerning the strength of materials under repeated stress, give a brief review of the current theories of the fatigue of metals, and render an outline of the equipment and the methods applied in making experimental tests relative to the fatigue of metals. In compiling tables relative to tests, the aim has been to make available in compact form the results of tests covering various materials, showing the chemical composition and the heat-treatment of each metal, thus enabling the use of the results to be applied to similar materials. The information has been recorded from a sufficient number of repetitive tests to make it reliable.

Two chapters concerning the fatigue of non-metallic materials, wood and concrete, are included. The volume has eleven chapters in which are covered: the strain and stress in metals; slip, overstrain and hysteresis; fracture under repeated stresses; the effect of the range of stress on fatigue strength; and fatigue failure under service conditions. Twenty-two tables and 102 illustrations are included. The book should be of value to metallurgists and to those whose duties cover the testing of the fatigue of metals.

MECHANICAL MOVEMENTS, MECHANICAL APPLIANCES AND NOVELTIES OF CONSTRUCTION. By Gardner E. Hiscox. Four hundred twelve pages, 6x9 in., cloth-board cover. Published by the Norman W. Henley Publishing Co., 2 West 45th St., New York, N. Y. Price $4.

IN the revised volume, which is the sixth edition, the author has broadened the scope of his work by including illustrations of the more modern motions and devices. He covers mechanical appliances and units found in diversified machinery, each device being illustrated by a line drawing and a brief description showing its working function and method of operation. Twenty-four chapters are included, among which are descriptions relative to the generation of power and steam, hydraulic power and devices, gas and air-gas devices, electric power and devices, railway appliances, gearing and gear motion, mill and factory appliances and tools, engineering and construction, drafting devices, radio telegraphy and the like.

Although the author has not the slightest desire to encourage the hopeless pursuit of perpetual motion, he has, nevertheless, described ingenious mechanisms devised by misguided inventors endeavoring to solve an unsolvable problem. The volume is intended for the inventor, the draftsman who must work out mechanical movements, and the average reader with a mechanical inclination.

INVENTIONS AND PATENTS. By Milton Wright. Two hundred twenty-five pages, 5½x8 in., cloth-board cover. Published by the McGraw-Hill Book Co., 370 Seventh Ave., New York, N. Y. Price $2.50.

WHEN a patentable invention has been conceived, much is left to be done before that vision becomes a reality. On this basis, the author presents sound advice for those interested in inventions so that patents can be secured with the least resistance and with a greater face value. The text deals with the procedure to follow before the patent is obtained, including such matters as the securing of patent rights, obstructions to avoid, and business undertakings to follow, all of which must be handled in a certain way. The author does not stop at the securing of the patent but carries on his advice to the manufacturing and marketing of the patent, including the finding of a buyer, selling outright on a royalty basis, how to raise capital, publicity, and making profit on the patented article. Other information is directed toward trademarks, infringement of patents, the selection of a patent attorney, and traps set for unwary or incautious patentees.

To guide the inventor in the precautions of foreign laws, a chapter has been included showing the characteristics of patent laws in Canada, France, Germany, Great Britain, Italy, Japan, Mexico, Russia, Sweden and many other countries. Of particular value for reference purposes is a chapter showing legal forms most usually required in connection with patent transactions involving assignments, licenses, transfers and agreements. The material is prepared in convenient form and will make a valuable reference volume for individuals or concerns confronted with patents.

Machining and Measuring Gear Teeth

By EARLE BUCKINGHAM
Associate Professor of Engineering Standards and Measurements
Massachusetts Institute of Technology

Use of the Saurer composite testing machine—Rack-type gear tester—Noise testing—Principles of the hobbing method of generating gears—Design of hobbing machines

A SIMILAR but more elaborate composite testing machine than those just described indicates or measures the uniformity and smoothness of action between a pair of gears instead of depending upon the "feel" of the operator. The Saurer testing machine, shown in Fig. 32, is a machine of this type.

A diagram of the operating parts is shown in Fig. 33. The gears are mounted on arbors spaced the correct distance apart. On each arbor is also mounted a plain disk, accurately ground to the pitch diameter of the gear. On one arbor both the gear and the plain disk are mounted on the same sleeve. On the other arbor, which also carries the indicating device, the gear is mounted on an external sleeve and the pitch disk on an internal sleeve. The indicator is fastened to the same sleeve that carries the pitch disk, while an arm that engages with the indicator is attached to the external sleeve that carries the gear. A plate which holds the chart is mounted on the fixed spindle. When the first spindle is revolved, the gear mounted on it drives the gear mounted on the double sleeve, while the pitch disk on the first spindle drives its mating pitch disk by friction. The indicator records any difference in the angular position of the two sleeves on the second spindle. If the gears are perfect, no angular movement takes place between these two sleeves so that the indicator pointer remains stationary and the chart will be a true circle. When errors are present in the gears, the indicator pointer moves accordingly and the chart will show a correspondingly irregular line. If the gears are correct and the diameters of the pitch disks are correct, and provided no slippage takes place between them, the chart will be a perfect circle. An error in the diameters of the pitch disks or slippage between them results in a spiral chart.

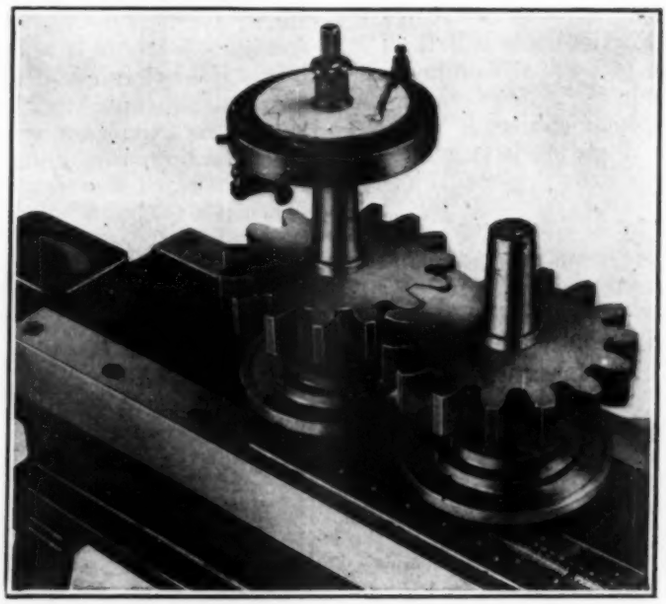


Fig. 32—Saurer composite gear-testing machine

As a matter of fact, a slightly spiral chart is often of advantage as the gears may then be revolved two or three times, and the succeeding charts may then be closely compared with each other.

In Fig. 34 is shown charts made by pairs of 15-tooth gears of different degrees of accuracy. The actual charts are about 3 in. in diameter. A variation of about $\frac{1}{16}$ in. from a smooth line on the chart is caused by a difference of 1 min. in the angular position of the two sleeves on the indicator spindle. All of this error may be in one gear or it may be partly in one and partly in the other. If both are identical, a variation of $\frac{1}{16}$ in. on the chart would indicate an error of 30 seconds of arc in each gear. By testing the gears against an accurate master gear, the errors can be definitely located and measured. An analysis of the chart enables errors in spacing, profile, and in concentricity to be determined very closely. An eccentric gear makes an eccentric chart. If the ratio is other than one to one, the eccentricity develops lobes, which indicate the particular gear of the pair that is at fault. Errors in spacing show up as steps, while errors in profile develop irregular patterns, depending upon the nature of these errors.

Another somewhat similar testing machine, developed by the Gear Grinding Machine Co. of Detroit, Mich., is the one shown in Fig. 35. In effect, it tests the gear against a master rack instead of its mating gear. The

The fifth article. The sixth will appear in an early issue.

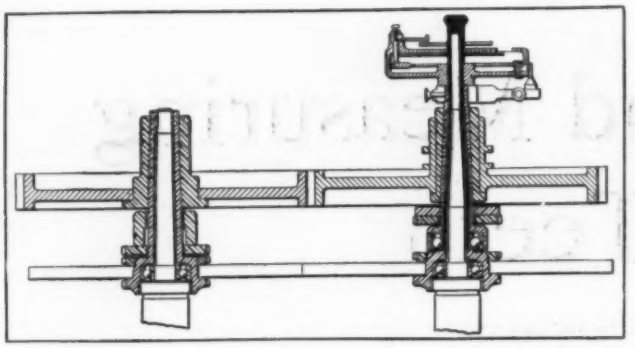


Fig. 33—Design of the Saurer testing machine

gear to be tested is mounted on a vertical spindle which has an arm with an indexing arrangement so that the spindle may be rotated in increments of 1 deg. A tooth of this gear engages with a cone-shaped disk on the lower horizontal shaft. A section of this cone-shaped disk represents the profile of the basic rack. This horizontal shaft can move end-wise, and the cone-shaped disk is held in contact with the gear tooth by a spring. The position of the upper horizontal shaft is controlled by a micrometer screw. A multiplying lever and dial indicator enable any difference in the end-wise position of the two horizontal shafts to be measured.

In operation, the gear and the rack element are positioned at one end of the arc of contact, and the dial indicator is set to zero. The gear is then rotated 1 deg. and the upper shaft is moved by the micrometer screw a distance equal to the arc of 1 deg. on the pitch line of the gear. If the action between the gear and the basic rack element is correct, the dial indicator will then be at zero again. Any deviation of the dial indicator represents a corresponding error in the action between the gear and its basic rack. This operation is repeated through the arc of action, and the deviations may be plotted on the same type of chart as shown in Fig. 27, or on standard cross-section paper.

Flat disks and needle-pointed or knife-edge elements are also used on this testing machine, thus making it universal in its action and enabling the exact profile of a gear to be determined, as well as its smoothness of action with a basic-rack element. In these cases, the movement of the micrometer screw will be that corresponding to the length of the arc of rotation on the base circle. Other conjugate forms than the involute may also be tested on this machine by providing a basic-rack element of the proper form. Thus the profile and action of gears made to the composite system may be tested on this machine by providing a disk with the profile of the basic composite rack of the proper pitch.

A larger instrument of this type is shown in Fig. 36. This testing machine will accommodate gears up to 72 in. in diameter. The principle of its operation is identical to that of the smaller instrument.

A modification of this type of testing machine is shown in Fig. 37. In this case the gear is tested against an accurate master gear mounted on the same spindle. Both horizontal shafts are provided with cone-shaped disks representing the basic-rack profile. Any variation in the endwise positions of the two horizontal shafts in relation to each other as the gears are rotated is indicated on the dial indicator as before. This instrument provides a very rapid means of testing gears in production, as a gear may be set-up and tested in about 15 seconds.

These testing machines have the advantage of being positive in their action as no pitch disks, tapes nor other friction device are employed, thus eliminating error due to slippage.

Projection apparatus may also be used to make a composite test of the gear tooth profiles. In this case the image or the shadow of the meshing teeth of a pair of gears is projected on a screen, and the action between them may be studied as the gears are rolled together. If edge contact at the beginning of mesh occurs, it can be very readily discovered by this method of testing.

In order to test gears for quietness of operation, it is necessary to mount the gears and run them under load. This is sometimes done after the gears are assembled in position in the gear cases. At other times a special fixture is provided consisting of two spindles with means for adjusting the center distance. One spindle is driven, preferably by a belt drive, while the other one has a drum or brake by means of which a load can be applied. Very simple fixtures of this type are often made and attached to a lathe or plain milling machine. In this case, the spindle of the machine becomes the driving spindle, while the cross-slide or table provides means for adjusting the center distance.

Having considered the various methods of testing gears, let us consider their production, first by hobbing, then by shaping. The method of producing gears by form milling is limited to gears that run at relatively low pitch-line velocities because of the errors in form that inevitably develop from distortion of the form cutter in hardening, inaccuracies in the form of the cutter itself, and errors in setting up the machine. These conditions, and also the search for methods of more rapid production led to the development of the hobbing process.

This process consists of revolving and advancing a worm-shaped cutter through a revolving blank. The ratio between the speed of the hob and that of the gear blank is determined by the number of threads or starts on the hob and the number of teeth to be cut in the gear blank. Thus if a single-threaded hob is used to

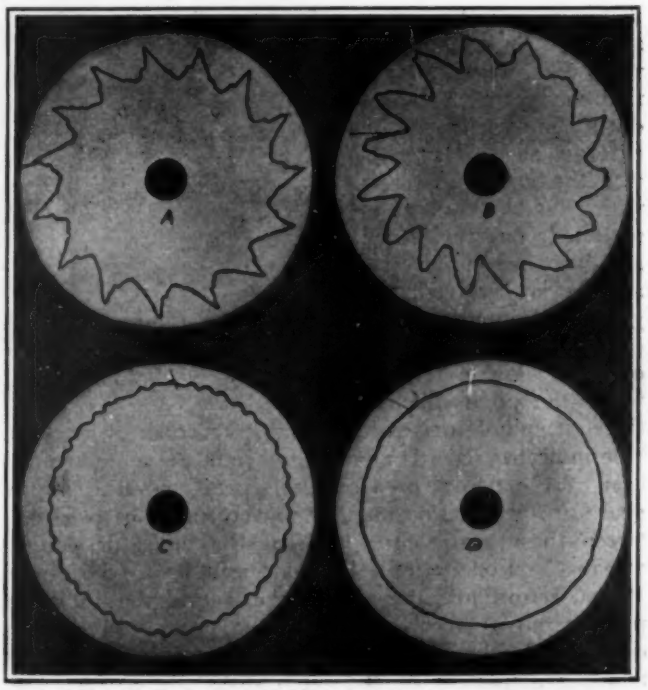
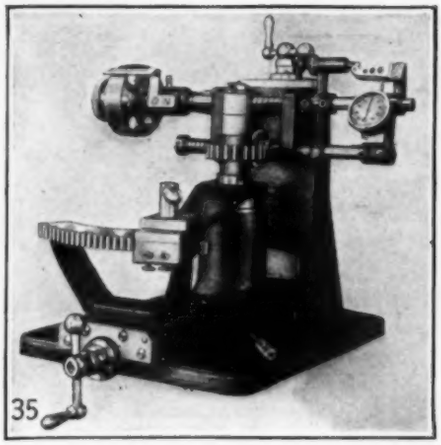
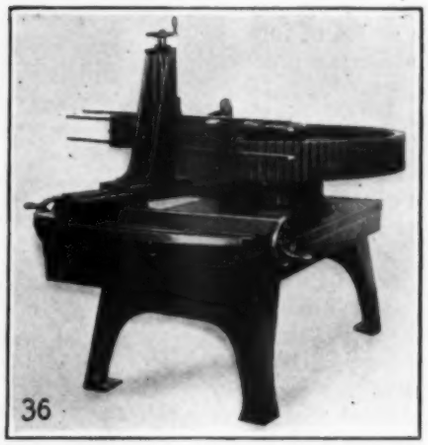


Fig. 34—Typical charts produced on the Saurer testing machine with 15-tooth pinions





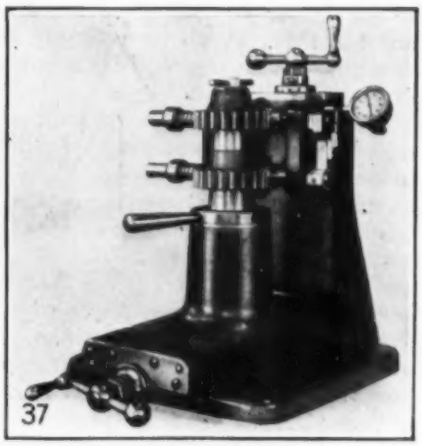


Fig. 35—Rack-type gear-testing machine. Fig. 36—Similar type of machine for testing large gears. Fig. 37—Testing machine of basic-rack type employing a master gear

cut a 24-tooth gear, the hob would revolve twenty-four times while the gear blank revolves once. If a double-threaded hob were used, the hob would revolve twelve times while the gear blank revolved once.

In general, the hob is set at such an angle in relation to the teeth of the gear being cut that the helix at the middle of the tooth of the hob is tangent to the sides of the gear teeth. In Fig. 38, the cutter head and work arbor of a typical hobbing machine is shown.

Hobbing is a generating or molding process. A simple conception of this method is to consider any axial section of the hob as representing the basic rack. Successive axial sections, because of the lead or helix, in effect, will advance this basic rack in the direction of the axis of the hob as the hob is revolved. Thus, when the hob has completed a full revolution, the basic rack will have advanced one full tooth interval. This process has the advantage of requiring but one hob to produce mating gears of any number of teeth. It also possesses the advantage over form milling of enabling more effective tooth proportions to be used when desired, using the same cutting tool, while a special form cutter would be required in each individual case with form milling. For quantity production in particular, hobbing has proven to be a rapid and effective method. All motions are continuous, and, except for the feeding, all motions are rotary. Such continuous rotary motions are usually conducive to rapid production.

The many advantages of this method of production soon led to its wide adoption. But it soon became apparent that this newer process in itself did not eliminate all of the difficulties of producing accurate gears. There are still many problems to be solved before that end is reached, some in relation to the machines and others in relation to the hobs. We will first direct our attention to the problems of the hobbing machine.

Many types of hobbing machines are now on the market. All of them, however, follow certain general lines. The gear train between the hob and the work arbor, which carries the gear blanks, in its simplest form is shown in the diagram, Fig. 39. In addition to the movements shown, provision must be made to allow for the adjustment of the hob to suit both the diameter of the gear blank and the helix angle of the hob. Provision must also be made to obtain the necessary feeding of the hob through the gear blank. These motions have been omitted from the diagram to simplify it.

The accuracy of the product depends upon three primary factors: First, the accuracy of the hobbing machine and work-holding fixture; second, the accuracy of the hob; and third, the carefulness of the operator in setting up the gear blanks and the care exercised in resharpening the hobs.

Inaccuracies in the functional parts of the hobbing machine will be reproduced in the product. The work spindle and arbor on which the blanks are mounted must be concentric, otherwise eccentric gears will be produced. The index worm and wormwheel are also vital elements of the hobbing machine. The index worm and spindle must be concentric and must run true, else an irregular motion will be imparted to the wormwheel and work spindle that will result in troublesome tooth profile errors on the product. The index wormwheel in turn must be concentric with the work spindle. Any eccentricity in the wormwheel will cause the work spindle to accelerate for half a revolution and decelerate for the remaining half, thus introducing errors in the tooth profiles of the product that will be indentical in their results to the same amount of eccentricity in the mounting of the gear blanks. The teeth in the index wormwheel must also be accurately spaced. Inaccuracies of spacing here will be reproduced in the product partially as spacing errors and partially as tooth profile errors.

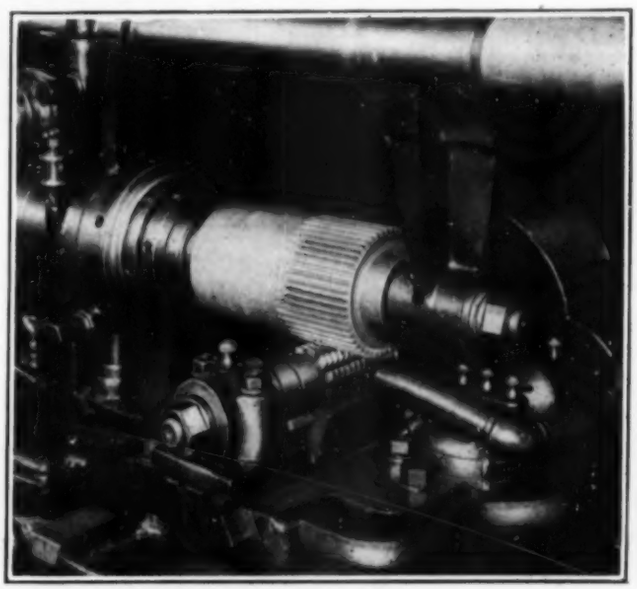


Fig. 38—Gear being cut by a typical hob

The cutter or hob spindle must also be concentric and run true. Any eccentricity or cam action of imperfect thrust bearings will be reproduced in the product in the form of troublesome tooth-profile errors.

The most important factor of the change gears is their concentricity. This is one application where eccentricity in gears is a serious defect. In such a train of gears as this, the cumulative error in position caused by eccentricity will be reproduced in the product both as spacing and tooth profile errors. The effect of this eccentricity can be reduced by having the tooth numbers of all gears in the train an even multiple of the tooth number of the smallest gear in the train. Thus, if the smallest gear had 18 teeth, the tooth numbers of all the other gears should be some multiple of 18, as 54, for example.

Backlash in the thrust bearings of either the index-worm spindle or the hob spindle will result in faulty tooth profiles on the product. The cutting thrust between the hob and the gear blanks varies during the cutting cycle, both in direction and amount. Sometimes the cutting is all on one side of the hob tooth, then on both sides, and then on the opposite side only. In order to reproduce the maximum accuracy of the machine, two finishing cuts should be taken, neither of them cutting at the root of the tooth space of the gear blanks. The first finishing cut would be taken on one side of the gear tooth only, while the second cut would finish the opposite side of the gear tooth. In this way the cutting thrust between the hob and the gear blanks is held in one direction only, which tends to minimize the effects of backlash in the thrust bearings of the index-worm and the job spindles, and also in change gears and other connections between the hob spindle and the work spindle.

The construction of the hobbing machine must be sufficiently rigid to prevent excessive deflection, torsion, or vibration of the machine and its operating parts under the cutting load. The advantages of the accuracy built into the machine will be lost entirely if its construction is not sufficiently rigid. The rigidity of the machine controls in large measure the maximum rate of production. Slower cutting speeds and finer feeds must be used when the construction of the machine is not stiff.

Hobbing machines are made in many types. Some have horizontal work spindles while others have vertical work spindles. In general, the vertical work spindles are used on the larger machines, as this construction offers better opportunities of clamping the work. The smaller gears are usually cut in multiple on arbors so that the position of the work spindle is of secondary importance.

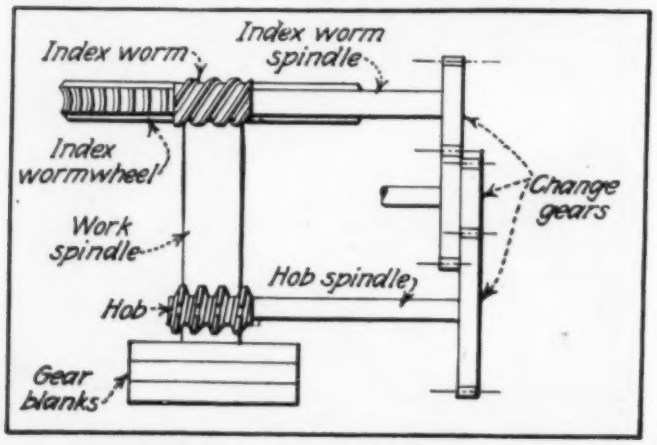


Fig. 39—Simplified gear train connecting the hob and work arbors

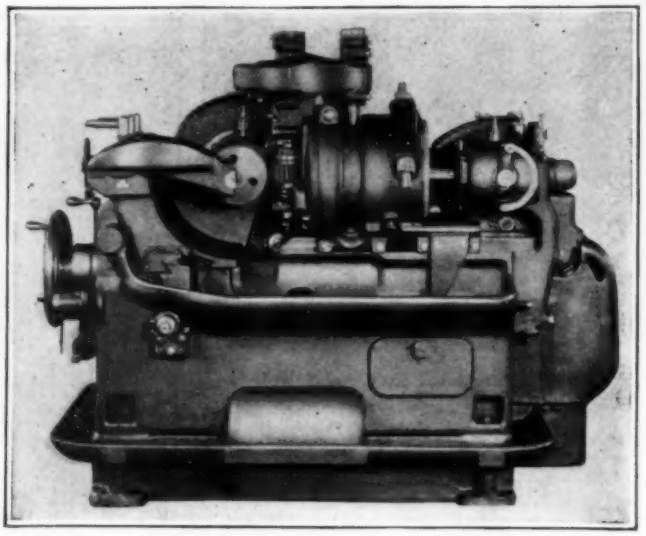


Fig. 40—Hobbing machine of rigid construction for cutting automotive gears

The larger hobbing machines and some of the smaller ones are made of a universal-purpose type. Other smaller machines are made of a single-purpose type, primarily for the rapid production of the gears used in large quantities for automotive construction. These machines are simplified as much as possible in their construction and made as compact and rigid as possible. In Fig. 40, one machine of this type is shown.

An Old Bit-Brace—Discussion

By Charles S. Beach

IN AN article under the title given above, on page 568, Vol. 66, of the *American Machinist*, George Wilson asks if any of the readers can tell anything about such braces as the one he describes. Replying to this part of Mr. Wilson's article, I submit the following:

The illustration as shown would seem to have been made from a Fenton and Marsdens, Bridge St., Sheffield, England, tool. This make had a pivoted thumb latch for releasing the bits, while a very similar bit brace with a round piston-formed latch, was made by Ibbottson.

The Fenton & Marsdens tools were of maple, beech or ebony. They were all beautifully finished and perfectly fitted. The maple or beech braces were brass mounted, and fitted with thirty-six tools, consisting of twelve center bits from about ¼ to 1¾ in.; seven plain pod bits from $\frac{3}{32}$ to about ½ in.; seven lipped pod bits for endwise boring, about the same sizes; two lipped pod sash bits, one ⅝-in. auger bit; two burr countersinks for wood-screws; two flat countersinks for metal; one long taper reamer for wood; one ½-round taper reamer for metal; and one square taper reamer. These bits and reamers were all beautifully straw colored.

There were two ebony- and german-silver mounted outfits in use in my father's shop. They were of the same pattern, both were fitted with forty-eight tools, and as I recall them there were eighteen center bits. The tools in these sets were of nearly the color of german silver.

Nearly fifty years ago I bought a bit-brace of this design, made by Moulson Brothers, Sheffield, England. It was of beech wood, and the grain was particularly noticeable since the growth lines were so far apart.

Fig. 1—The angular support is machined by surfacing it on a large Diamond face-grinding machine. The casting is located by the fixture in such a manner that the proper angle can be maintained while the ends are kept square. As may be seen in the illustration, the operator is using a special gage with which to test the accuracy of the work

Stoker Building Operations

Fig. 2—Squaring the edges of side plates on similar machine using sectional grinding wheels. Work held in fixtures

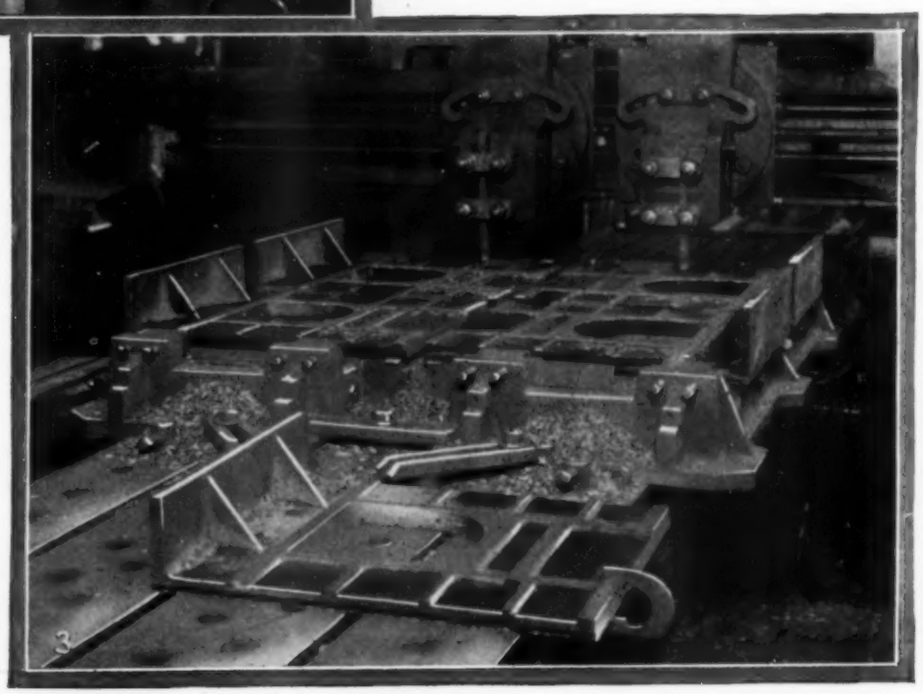


Fig. 3—Planing ribbed surfaces of front plates to fit boiler front. The plates are held very carefully to avoid springing and are planed on both sides, being turned twice to remove as much of the stress as possible. Each plate is held to within 0.002 in. of parallel in its own length

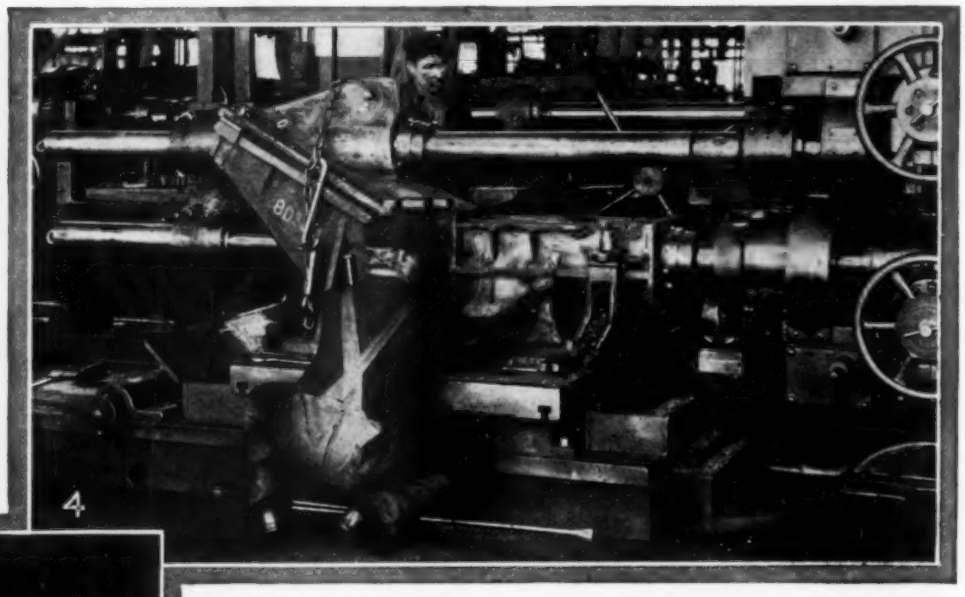
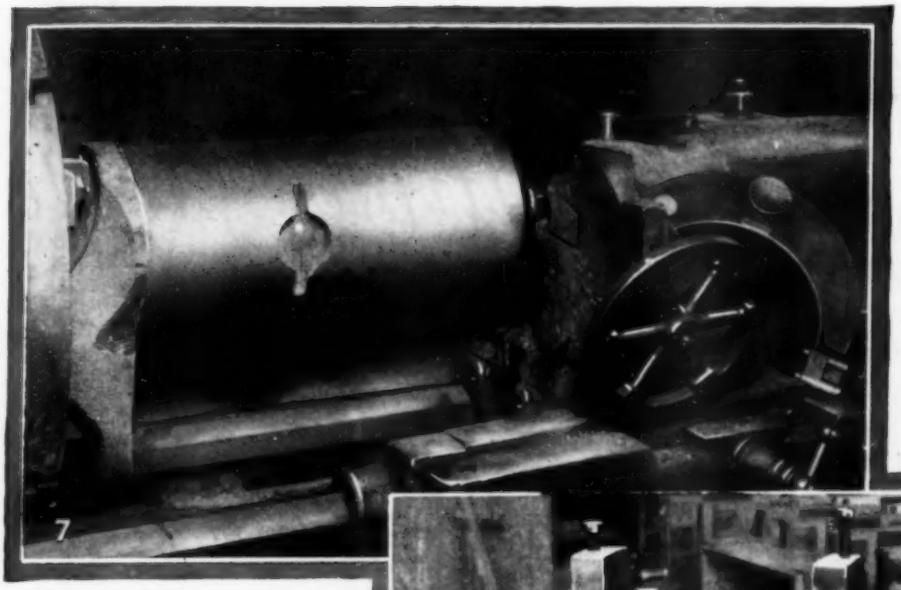


Fig. 4—In order to have the stoker function properly, it is necessary that the cylinders in the ram box be bored accurately parallel. To this end all the boring is done at the same setting of the work. The machine used is one that was built specially for this job

ACCURACY and mechanical stokers are seldom considered as being closely related. Yet in order to secure proper operation, the parts must fit far more closely than might seem necessary. And so another job that we have classed as "rough," comes under the better class of workmanship. Shipshape alignment of the parts is necessary not only for the appearance, but for the proper working of the parts coupled together. For this reason great care is taken in surfacing the side plates and the plates that support the ram boxes on the front of the boiler. A few of the operations are shown herewith

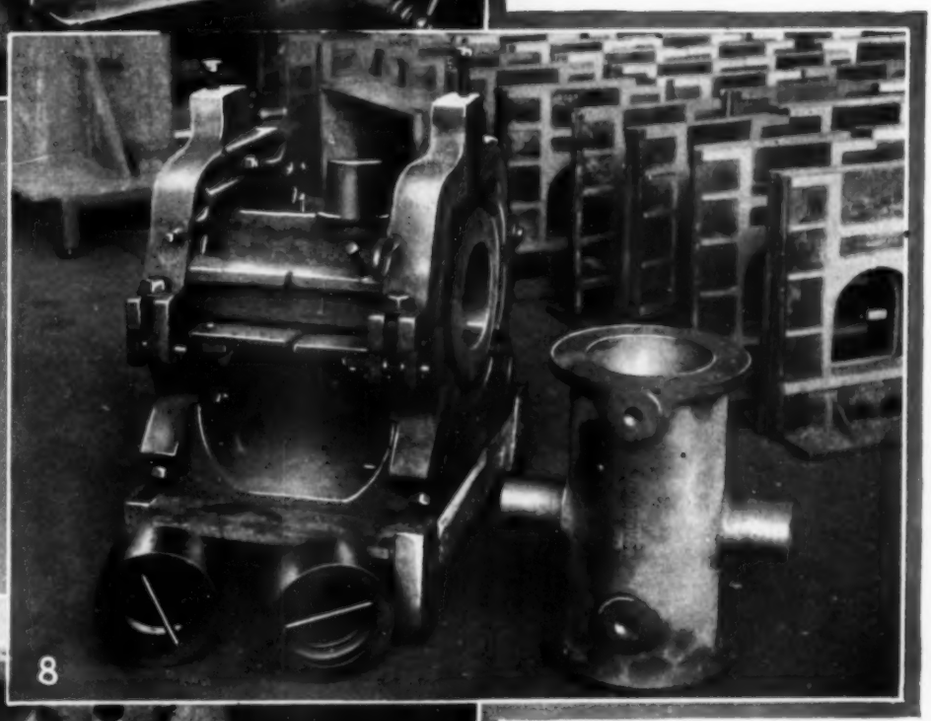
Fig. 5—Setting cutters in boring head with special device. Tooth contact and multiplying needle enable each tooth to be set to same radius

Fig. 6—Inspecting both ram bores with plug gages



Photographs by courtesy of the American Engineering Co., Philadelphia, Pa.

Fig. 7—This view shows the stoker ram being turned. The only things out of the ordinary are the method of driving and the block for holding the tool. Instead of being driven in the usual manner, the long ear on the end of the ram takes the place of a dog



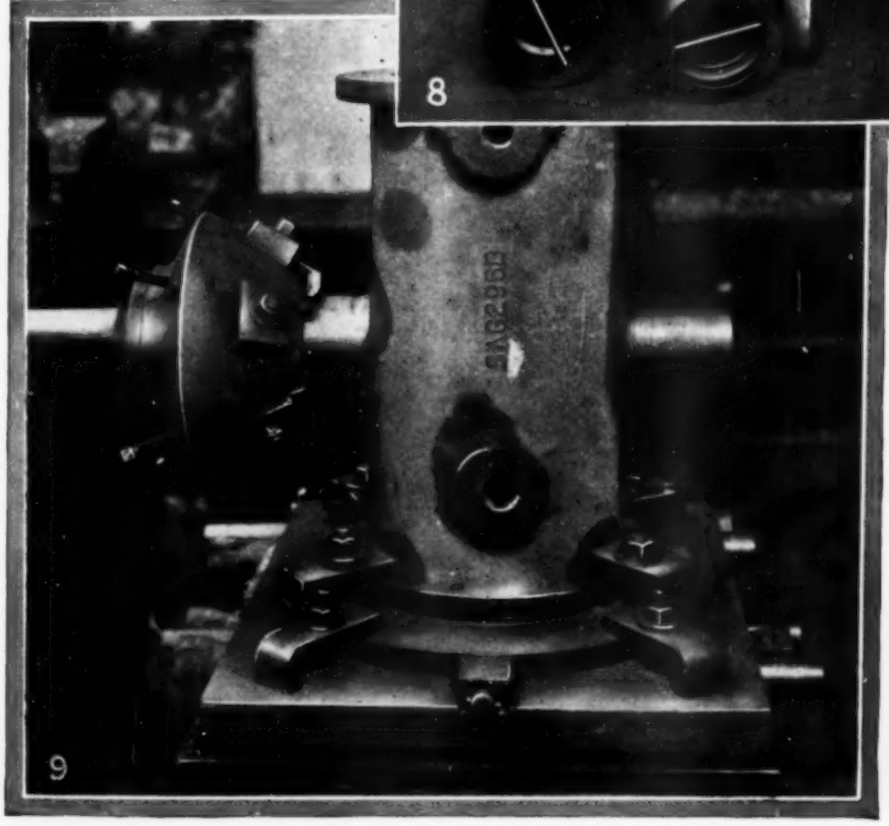


Fig. 8—Fixture for boring steam cylinder for dump plates. Fixture is practically two steady rests cast on a base plate

Fig. 9—Hollow milling tool fixture for trunnions of cylinder. Fixture is indexed. Tool is driven by boring bar of horizontal boring machine

Automatic Multiple-Spindle Equipment for Sewing Machines

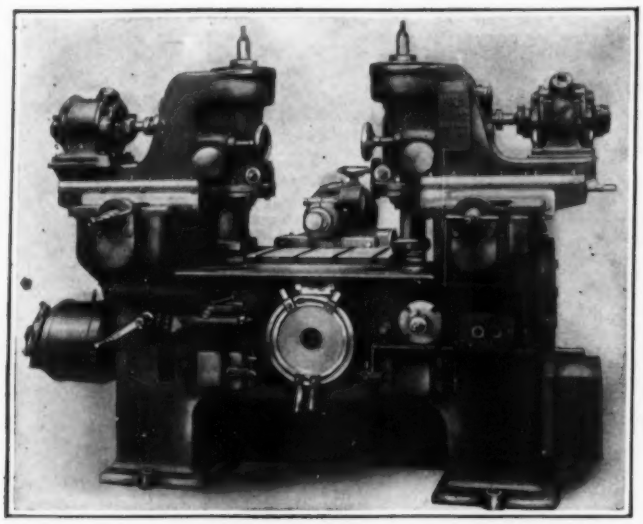


Fig. 1—A production milling machine, built in Germany, for milling the arms of sewing machines. Features of the machine include direct motor drive, a separate motor being used for each spindle and for the feed mechanism, and automatic control that is simultaneously operated by means of an interlock

Photographs by courtesy of the Droop & Rein Tool Works Bielefeld, Germany

SPECIAL multiple-spindle milling and drilling machines that have been designed for use in the manufacture of sewing machines are shown in the accompanying illustrations. One of these machines is driven by belt. The other machines are each driven by means of individual electric motors that are directly connected to the spindles of the machine.

A single motor is used for each group of spindles and another separate motor is used to operate the feed movements. The control of the motors is interconnected so that the starting and the stopping of the spindle drive of the machines are effected simultaneously with the starting and the stopping of their feeds.

The spindle and the feed movements are controlled by means of a disk which can be seen in the illustrations. This disk has adjustable stops which are intended to reverse the feed, to return the spindle heads to their starting positions, and, in addition, to stop the machine. When a new piece of work has been inserted in the machine, the machine is started again by means of a pushbutton. The controls, as can be seen, are within easy reach of the operator.

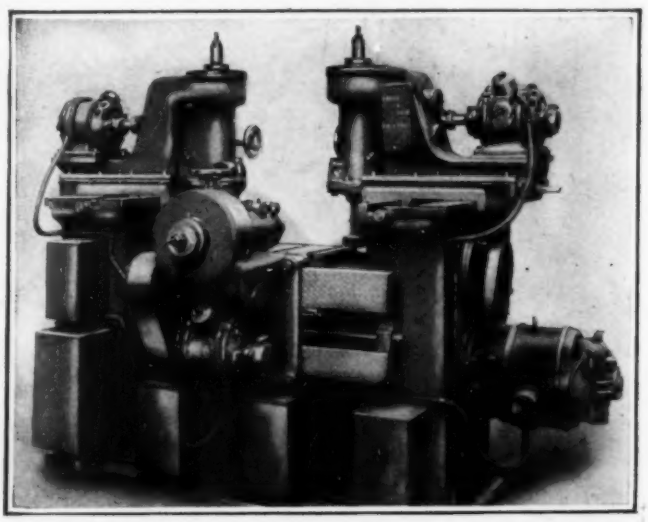
The milling machine that is shown in Fig. 1 is designed for milling the arms of the sewing machines. The horizontal spindle of the tool is intended for machining the base of the arm, while the two vertical spindles of the tool are intended for machining the face and the rear end of the arm. The drive to the horizontal spindle is shown in Fig. 2. The traverse mechanism can also be seen in this illustration.

The belt-driven multiple-spindle drilling machine that is shown in Fig. 3 is intended for drilling the holes in the sewing machine arm. This machine has four groups of drilling spindles that are horizontally arranged, as well as a single vertical spindle that feeds upward. This machine has a total of twenty-nine drilling spindles. The slides that carry the heads of the spindles are fed by means of drums that are located inside the bed and below the slides of the machine. After a full revolution of the feed drum, the friction clutch of the driving pulley on the machine is automatically released. In Fig. 4 is shown the control cam of the machine.

Another multiple spindle drilling machine is shown in Fig. 5. This machine has a direct motor drive and it is automatically controlled. The machine shown in this illustration as well as the one shown in Fig. 6 are intended for drilling the side frames and the connecting girder for the two side posts of the sewing machine.

The drilling machine shown in Fig. 5 has thirteen spindles that are arranged horizontally and vertically, while the machine shown in Fig. 6 is provided with ten drilling spindles and, in addition, a small facing head for dressing an inside face of a hub for the sewing machine. Three of the vertical spindles of the latter machine are supplied with swiveling drilling heads to allow for adjustment of the drills so that the machine will accommodate pieces that require holes with various center distances. The saddles of the machine are controlled by feeding screws that are operated by means of a separate disk-controlled motor.

Fig. 2—Another view of the milling machine. This photograph shows the worm drive to the horizontal spindle. The horizontal spindle is for milling the base of the sewing machine arm, while the two vertical spindles are for machining the face and the rear end of the arm. The method adopted for traversing the spindle head can also be seen in this view of the machine



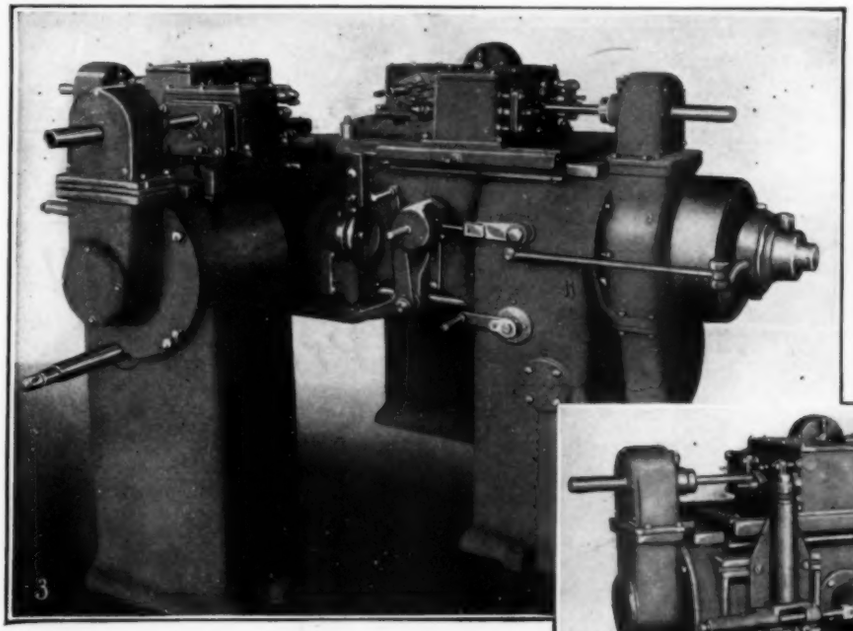
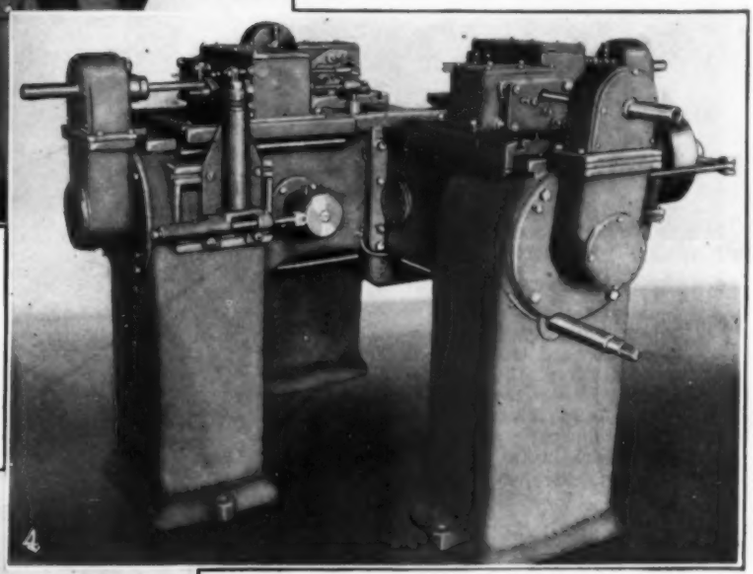


Fig. 3—A special automatic multiple-spindle drilling machine. This tool is belt-driven but is automatic in its operation. It is designed for drilling the holes in the sewing machine arm after the milling operation. The machine has twenty-nine spindles

Fig. 4 — This photograph shows a rear view of the special multiple-spindle drilling machine for sewing-machine arms. The cam control of the machine can be seen at the center. There are four groups of horizontal drilling spindles and a single vertical spindle that feeds upward



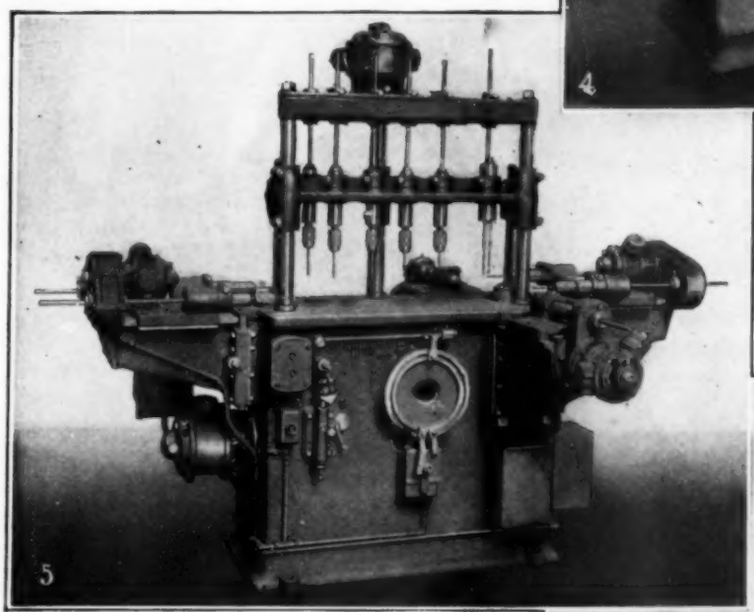
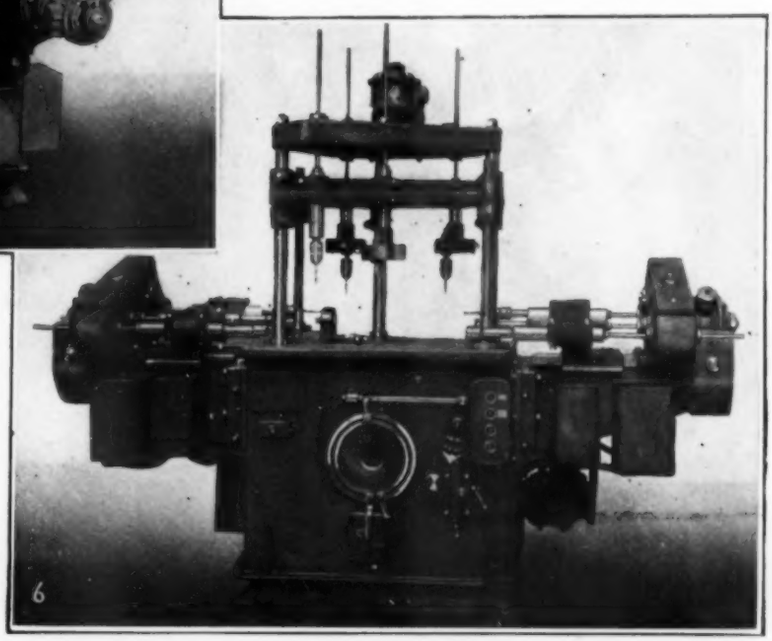
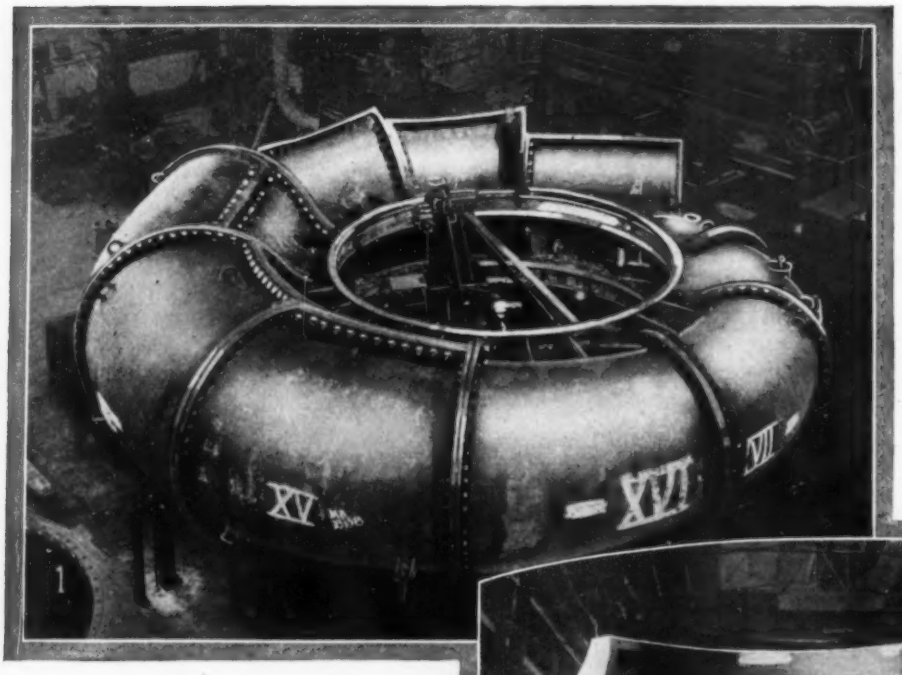


Fig. 5—This multiple spindle drilling machine is intended for drilling the side frames of the sewing machines. It has a control cam similar to the one used on the milling machine and, similarly, it has a direct motor drive as well as being entirely automatic in its operation. The machine has thirteen spindles that are arranged horizontally and vertically

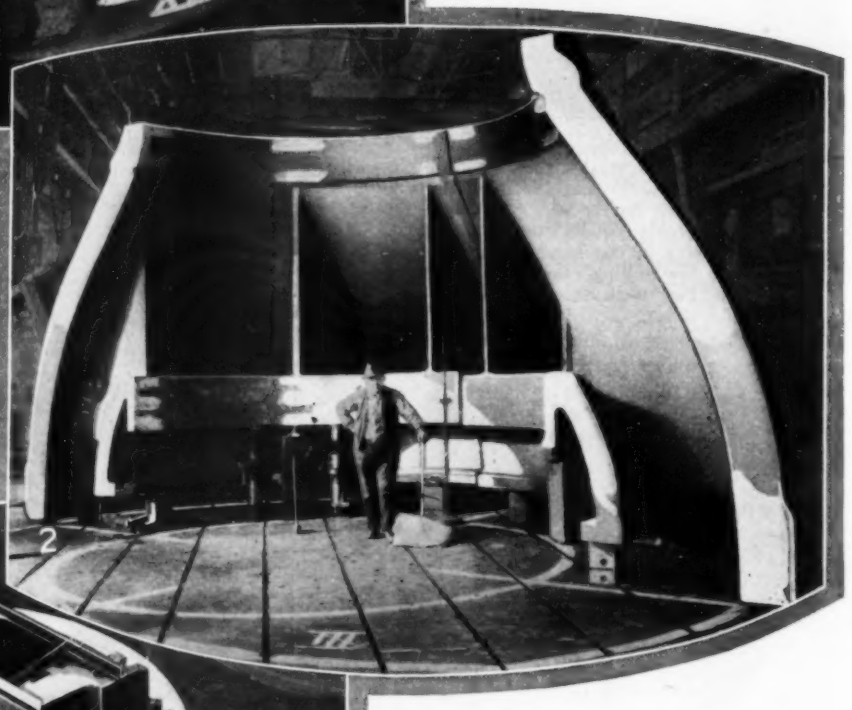
Fig. 6—Another machine for operations on the side frames is the multiple-spindle drilling machine shown below. It has ten drilling spindles and a small facing head for dressing a hub



Reversing Usual Boring Mill Practice

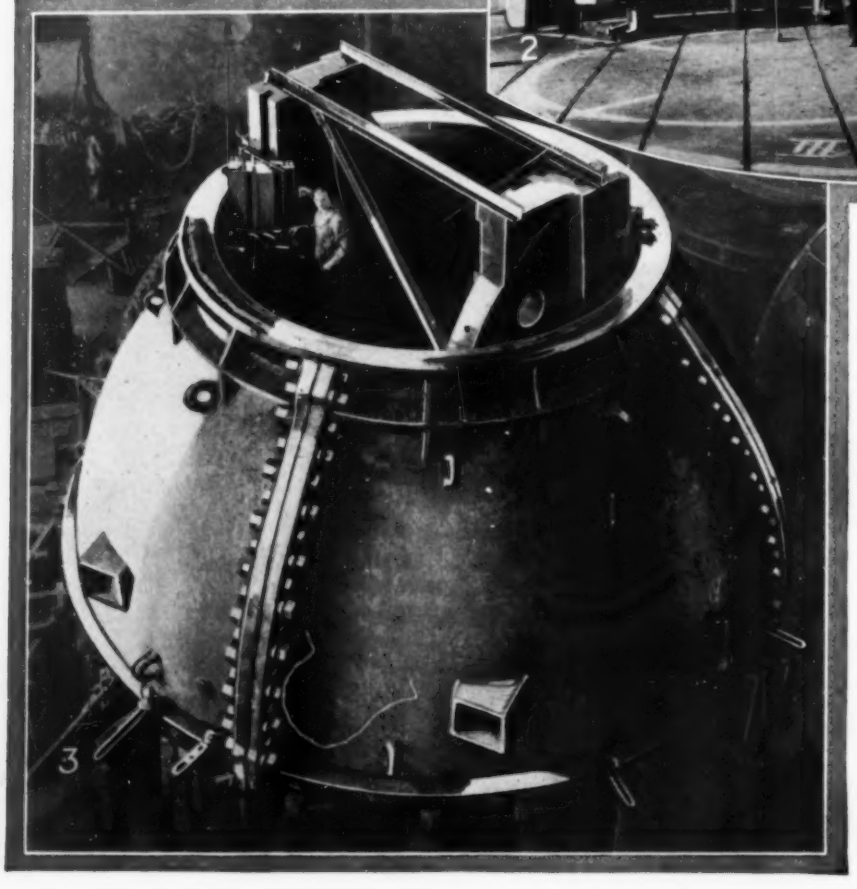


1—Boring the casing. The boring mill, stripped of its cross-nail and housings, is lowered into the circular opening in the casing. The boring head is mounted on the machine table and is provided with means for feeding it in the necessary directions



2—Setting up a Johnson valve for boring. Large diameter 21 ft., small diameter 14 feet

Photographs by courtesy of the Wm. Cramp & Sons Ship and Engine Building Co.



3—Boring-mill housings mounted on its table and revolved inside work. The turbine casing is built around the boring-mill table

Inspection of Naval Material

By Capt. H. C. Dinger, U. S. N.

Methods used in inspecting material at the source of supply—Advantages to be secured by the consolidation of inspection offices are many and great

ALL naval material purchased under cognizance of the material bureaus of the Navy Department, is subject to inspection at place of manufacture or origin. This insures that the requirements of the contract and specifications will be met before material is shipped. The inspection force also acts as a valuable means of contact between the Navy and the commercial activities that produce our naval material. This liaison is a very important matter, and through it the industries of the country are kept informed of the needs and requirements of naval material, and the Navy informs itself of the productive ability, development and effectiveness of industry. Besides performing the inspection function, this service acts as a developing agency to insure better material, improved performance and improved standards of workmanship. Though a comparatively small force is employed (about two hundred, including officers, assistant inspectors and clerical force) this service reaches out to the manufacturers all over the country. It is an extremely important service both for the Navy and for industry. It is therefore essential that organization and methods of administration be as effective and as efficient as they can be made. This service is administered by Naval officers assigned to the various offices as officers in charge and as assistants, and these men are supplemented by civilian assistant-inspectors who are experts in the various specialties that are required.

It is the general practice to have naval material inspected (1) during the process of manufacture at the individual plant; (2) at the assembling plant, such as a shipbuilding yard, airplane factory, machine or boiler shop; (3) on receipt at naval station or other activity where it is delivered.

Each material bureau is charged with the duty of drawing up the requirements for the inspection of material under its cognizance. The inspection service under (2) above is maintained quite separately under each bureau, except that occasionally the inspector of machinery or engineering material may also be inspector for ordnance and for navigational material. The inspection under (3) is provided by the yards or individual activities receiving the deliveries. At most of the Navy Yards it is a consolidated force for materials under the Bureaus of Engineering, Construction and Repair, Yards and Docks, Ordnance, and Navigation. Fuel inspection and the inspection of food and clothing are handled separately under the Bureau of Supplies and Accounts.

Inspection under (1) is directed separately by each bureau, but a certain amount of consolidation has existed in the inspection offices. There have been several offices that inspect for all material bureaus, and a considerable number that inspect for two or more bureaus. By a recent order of the Navy Department, consolidation of inspection offices has been ordered, the advantages of which are as follows:

(a) Greater economy, because the total inspection can be carried on by a smaller total force. This applies to both office force and inspectors. It is believed that a reduction in cost of inspection of 20 per cent can be made within a year.

(b) Greater efficiency, since in a consolidated office there would be a larger number of inspectors, and therefore a greater variety of inspectors especially trained for any particular work could be available.

(c) Greater simplicity and less confusion. Papers would not be sent to the wrong office as is now often done. The manufacturers in any one consolidated district would know that any naval material, no matter for what bureau, would be inspected by a representative from one definite office.

(d) Much greater flexibility to take care of big fluctuations in work.

(e) Better records can be kept in one large office than by the same force split into several small ones.

(f) Better and more effective contact can be kept with the manufacturers and more effective service can be rendered in developing and suggesting improvements in naval material.

By a recent order of the Navy Department, authority has been granted to consolidate the inspection functions of the signatory bureaus in all naval inspections. By this consolidation, it is fully expected that an annual saving of at least twenty per cent can be effected in the cost of all inspections of material and work

This idea of consolidating inspection offices is not new, but efforts toward that end have never before met with success. Each district is to be in charge of a line officer or naval constructor. Special work is to be taken care of by assigning a specialist officer, either in charge or as one of the assistants.

Field or factory inspection is essential for the following reasons:

(a) To furnish an accredited naval representative at the plant of the manufacturer to explain the requirements and to determine whether or not the material meets the requirements of the contract.

(b) To enable suitable contact to be made with the manufacturer.

(c) To guard against manufacturers proceeding in error, and then suffering rejection after shipment has been made.

(d) To locate unsatisfactory processes or materials at their inception, thus avoiding unnecessary expense to the contractor and delay to the Navy.

(e) To take records and observations of the progress and completion of contracts, and to keep the bureau concerned and the authority at delivery point fully informed of the situation.

(f) To study possible improvements in the character of the material being supplied, and to use this information in connection with new contracts and specifications.

Inspection service at shipyards or assembling plants is designed to make a general inspection of the vessel, or unit, during construction and has supervision over performance and acceptance tests, except such as are made under the special direction of trial boards.

Separate Bureaus

This inspection is directed by the several material bureaus concerned, and there is a separate organization under the Bureaus of Construction and Repair, Engineering, and Ordnance, for ships; under Aeronautics, for aircraft; while special building projects ashore are inspected by the Bureau of Yards and Docks.

These particular inspection services are practically an extension or branch office of the bureau that they represent. They not only inspect the finished work but also the shop work and all working plans are submitted for their criticism and comment to see that they comply with the contract and specifications.

Inspection at the naval station is necessary to establish the following:

(a) To determine whether all material required has been actually delivered, and that it has been delivered in good order. This serves as the final basis for payment.

(b) To guard against mis-shipment by mistake.

(c) If damage was incurred during transit, to establish the character and extent of damage, and the responsibility therefor.

(d) To make any inspection or test not previously made, and to make full inspection of such material as may not have been inspected at place of manufacture.

(e) As a check upon the thoroughness of the field inspection, and the accuracy of its records and returns.

(f) To clearly identify the material and shipment, and to give necessary technical information as to its care and stowage.

It may appear as if there were duplications in having field inspection and also inspection on delivery, but such is not the case. It is necessary to check up the receipt and to identify the material. It is also necessary to see whether the shipment is complete and that material has not been damaged. A certain check on the activities of the field inspection service is also very desirable. Tests made by the field inspection service are not repeated, but where material has been, for any reason, shipped without inspection, the required tests are made on delivery.

It is sometimes more convenient and desirable to waive inspection, or certain tests, at point of manufacture, and to have them made on delivery. The idea is to do the inspecting and testing at the most suitable point; hence, both a field inspection force and a delivery inspection force are maintained.

Ordinary chemical analysis and physical tests are made at the various navy yard laboratories, and the Bureau of Engineering also maintains a chemical laboratory at Pittsburgh. The inspectors have certain limited discretion in accepting analysis made by the manufacturer, or made for him by commercial laboratories. However, the Government reserves the right, in all cases, to make a check test or analysis at its own laboratories. The acceptance of manufacturer's test results of analyses will, in many cases, expedite deliveries and is ordinarily an entirely safe procedure. The provision that the Government may at any time make check tests insures care and accuracy of the analysis made by the manufacturer. Suitable cooperation may often expedite delivery and reduce inspection costs.

As soon as a contract is placed with a manufacturing firm, it is requested to report where the material will be manufactured. The inspection office concerned is then furnished with a copy of the contract and specifications, and is given directions by the bureau concerned, or by purchasing officer, to make inspection. The inspection office then communicates with the manufacturer and arranges for inspection. New contractors are carefully informed of all inspection requirements and the method of preparing necessary shipment papers and vouchers, to secure payment. During the course of production, inspection offices are sometimes communicated with for the purpose of giving the status on progress of work, or are requested to take any action that might expedite delivery. Any changes required during the life of the contract are communicated through the inspector.

In certain cases, drawings and schedules of material are required to be submitted, through the inspector to the bureau concerned, for approval. In other cases, plans are definitely approved at the time of making the contract.

Payments are made by supply officers on the basis of vouchers, or inspection reports, made by inspection offices, and on inspection calls made by authority at the delivery point.

A Liaison Office

The inspection service is a means for securing contact between the Navy and commercial industry, and is also a gatherer and distributor of information in connection with technical matters. These functions are extremely important in connection with preparedness. The inspection service is used to secure detailed information concerning manufacturing facilities, new and improved practices and development in engineering. Inspectors keep in touch with local engineering associations, trade organizations, etc., and can thus present to industry any naval needs, while they can report back to the Navy Department any useful development in industry. The inspection service thus becomes an organization for the development, distribution and assembly of technical information of the Navy and for the Navy. This of course becomes of immense potential value as a preparedness measure and as a means through which industry may be properly mobilized for naval needs in time of emergency.

Two things about design are certain: the objects designed must be salable and they must be usable. These conditions hold true whether or not the theories and formulas of design have been satisfied.

If you are disgruntled and sad because the boss could not see fit to give you the raise you asked for, and you still feel that you should be getting more money, don't impair your digestive apparatus by hanging on to the job in a half-hearted fashion. Don't make the high-speed steel toolbit think that it is carbon steel, blushing with shame. You have one of two jumps to make to get you out of that miserable state of lethergy; they are: Jump in and prove your worth to the foreman or jump out and prove your worth to yourself.

Automotive Production

Connecting-Rod Methods of the Marmon "8"

By Fred H. Colvin
Editor, American Machinist

Special fixtures that permit almost continuous milling—Elongating hole before sawing off cap—Electrically-controlled babbitting furnace—Milling face joints on cap and rod

EXCEPT for the selection of machine tools and fixtures, methods of machining of automobile connecting rods are fairly well standardized in some particulars. The variables named, however, afford not only interest but suggestions that can be applied in other lines of work. This article shows the methods used in the building of the new Marmon engine.

After straightening, if necessary, the rods go to the Rockford rigid mill shown in Fig. 1, which is equipped with indexing milling fixtures at each end of the table, the arrangement shown giving almost continuous milling. Both ends of the connecting rod are held in V-clamps, the bolt bosses on the large end affording a good grip and method of alignment. The rods are held in opposite directions on each side of each fixture and are clamped by means of the equalizing bar shown at *A*. In this way, two pairs of milling cutters, *B* and *C*, mill the large and small ends of the rod, respectively, no matter in which position the fixture is turned. The fixture on the other end of the table holds the rods in reverse order, so that by feeding the table first in one direction and then the other, the operator has time to load while the other pair of rods are being milled.

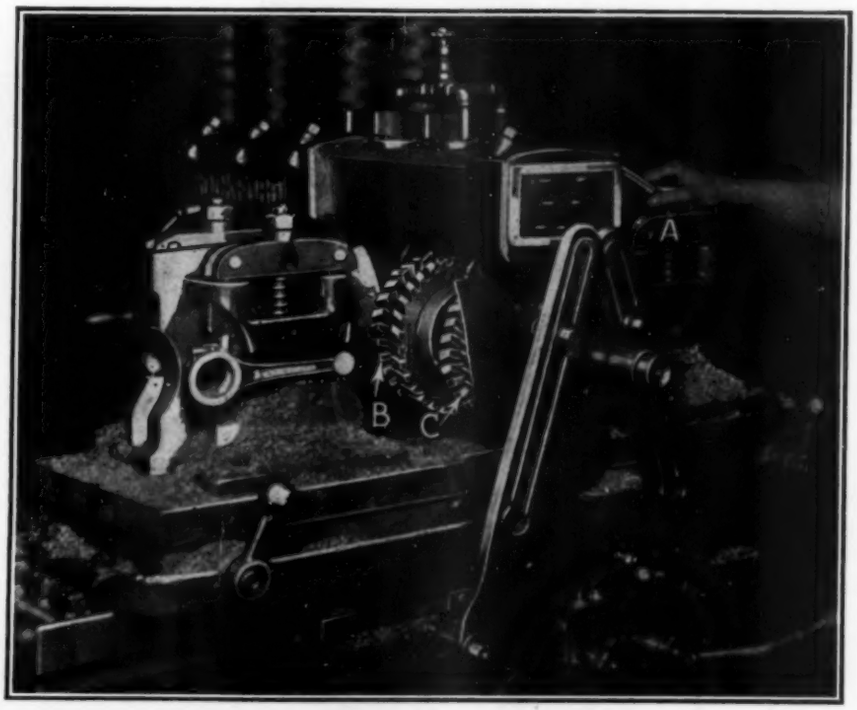


Fig. 1—Milling the sides of connecting rods

Both ends of the rods are bored at once, the three operations being shown in Fig. 2. Beginning at the left, with the rod as it comes from the milling machine in Fig. 1, the illustration shows the kind of tools used and how they are guided. This is the rough boring, the next operation being shown in the center. Here it will be noted that the large hole is bored off center, leaving some excess metal to be cut out of the cap end at the final boring operation. The elongated hole in the rod as shown at the right is produced in the third fixture by simply lengthening the center distance by the amount required to allow for the metal removed in sawing off the cap. The small ends of two rods are broached at a single operation

Automotive Production

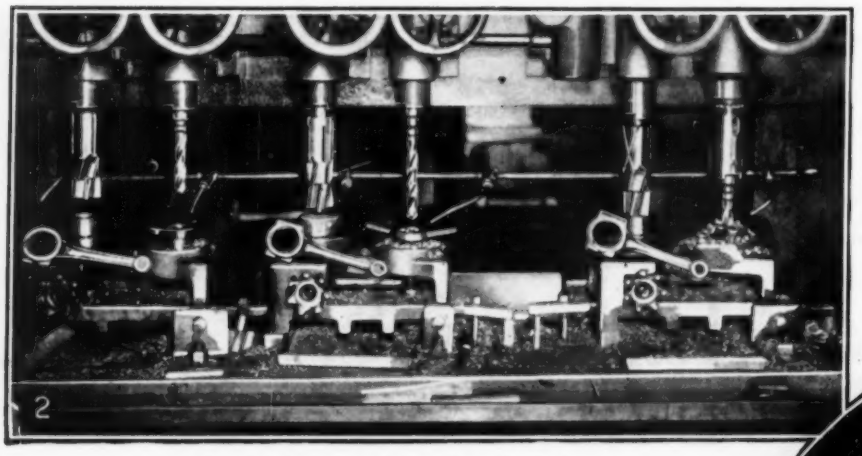


Fig. 2—Boring and elongating the holes

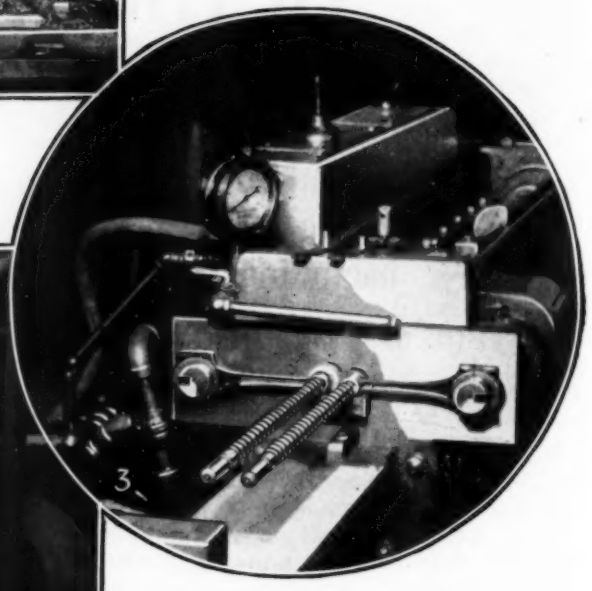


Fig. 3—Broaching two small holes at once

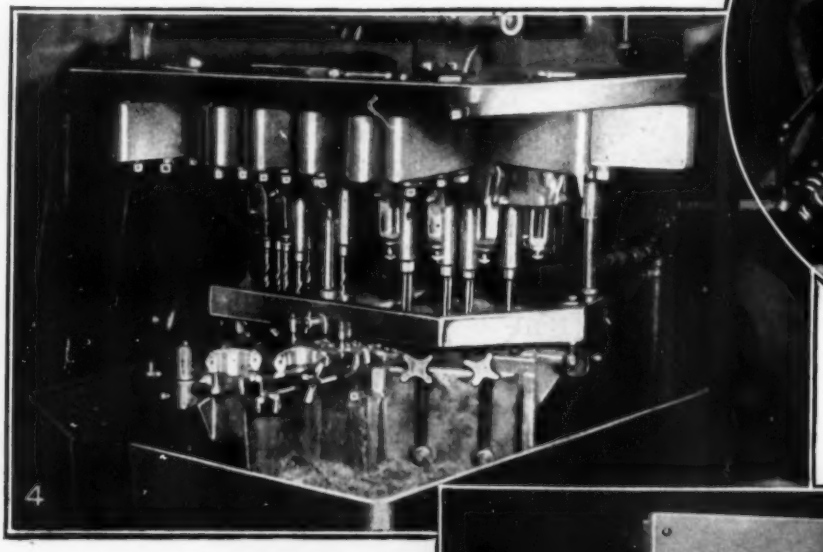


Fig. 4—Drilling and reaming rods and caps

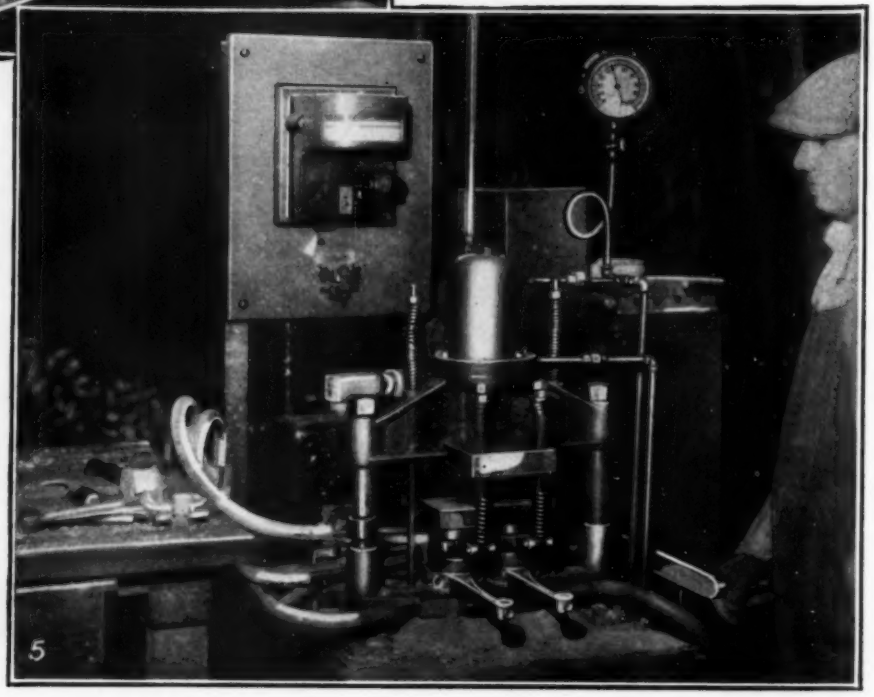
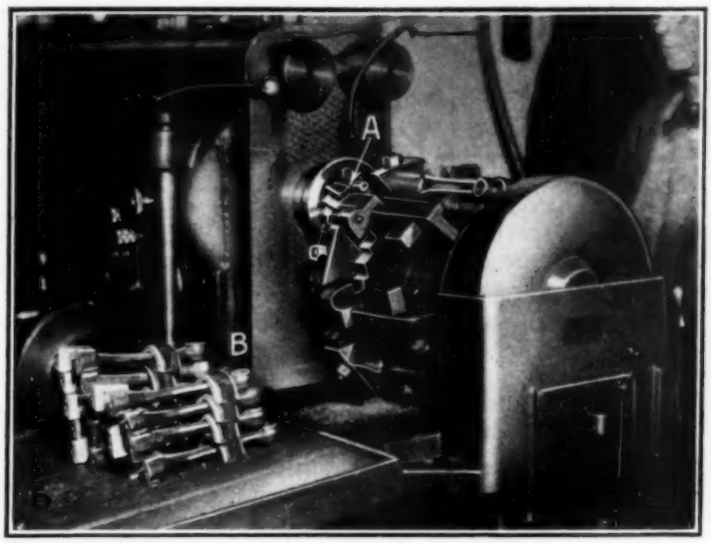


Fig. 5—Electrically controlled babbitting machine

Automotive Production



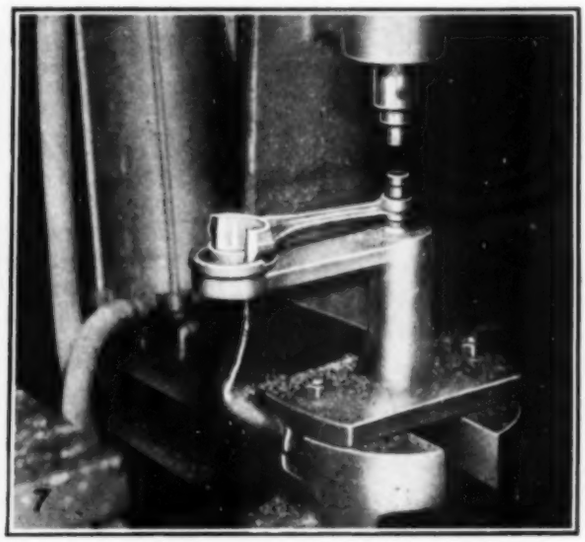


Fig. 6—Milling the joint faces of both rod and caps. *Fig. 7—Pressing in the piston-pin bushing*

on an American hydraulic machine, as shown in Fig. 3, after which the caps are sawed off in the usual manner. In Fig. 4 the bolt holes both in rods and caps are being drilled and reamed in a Natco multiple spindle machine. The bank of spindles at the left carries the drills, while the reamers are at the right, and the three lobed fixture affords a loading position while the other two operations are being performed.

Rods and caps are both babbitted in the Chadwick-LeClaire electrically-heated and electrically-controlled machine shown in Fig. 5. This machine controls both the temperature of the babbitting metal and the pressure applied, so that a great uniformity of bearings is secured. After the babbitting, both rods and caps go to the Milwaukee milling machine shown in Fig. 6, where the joint faces are milled on a revolving fixture by the end mill shown at *A*. This fixture is so designed that the rods can be handled quickly and accurately, the faces being so arranged as to take first a pair of rods and then a pair of caps. The rods are positioned by hardened studs that fit into the piston-pin holes. The speed of the revolving drum is timed so as to permit loading without stopping, assuring continuous operation. The rods and caps are shown at *B*.

The piston-pin bushing is then pressed in place in the air-operated press shown in Fig. 7, after which the rod and cap are assembled and both holes finish bored, before going to the assembly line. The Marmon plant was one of the pioneers in the use of diamond tools, and it is still using them to quite a marked extent for boring the piston pin bushings, the crankpin bearings and the main bearing seats in the crankcases themselves.

Pointers in Fixture Design

By Frank C. Hudson

BEFORE starting to design fixtures or tools for any kind of work, the first step is to study the features desired in the finished piece. Taking automobile pistons as an example, the object is to secure uniform weight.

In order to correct any eccentricity caused by the core, the first machining operation is to grip the piston on a mandrel having expanding points, or jaws, that center it from the cored hole. At the same time the thickness of the head is controlled by having the end of the mandrel to bottom against the under side.

While held in this way the outer diameter is rough turned, and the open end of the skirt is faced to a given length from the inside of the head. At the same setting, the open end is usually bored far enough to give a locating surface for future operations, a hook tool being used. Locating the piston by either end, and using internal forks to center the piston-pin bosses, the piston-pin hole is rough drilled, and a loose pin is used in the hole to pull the piston back on a stepped chuck that fits the open end of the skirt.

Another example is the cylinder block of an automobile engine. The main feature is the bore of the cylinders. It is highly desirable to secure a uniform wall-thickness between the bore and the water jacket. The fixtures, therefore, should insure that the cored holes for the cylinders are in line with the boring bars. Recognizing this feature, the old method was to use sight gages, or targets, and to set the cylinder castings by the bores. Failure to do this has generally resulted in very thin walls on one side and thick on the other.

It is, however, much more simple to locate the block by the cylinder flange, so that it is now the practice to take great care to have the flanges square with the bores. Then the flanges are faced, usually by milling, and the holes are bored afterward. The bolt holes in the flange are frequently used as locating points, two holes at opposite ends being carefully reamed for this purpose. As these bolt holes rarely exceed $\frac{3}{8}$ or $\frac{7}{16}$ in. in diameter, it is better to drill and ream two extra and larger holes, solely for location purposes for all future operations.

THE · FOREMAN'S · ROUND · TABLE

Abolishing Private "Mikes"

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"WHAT was the row in the grinding department this morning, Al?"

"Sort of a funny mixup, Ed. And one that may make Williams change our toolroom system a bit."

"How come, Al?"

"Well, you know the new man, Bill Howard, who came to work last week? He was grinding a lot of pins, and 'miking' them up pretty carefully. But when the inspector got his gages to work they all came back, said they were too big."

"And then what, Al?"

"Bill got his mike and showed that they were all within the tolerance—by his mike at least."

"Inspector gages off a bit, Al?"

"No, Ed, it was Bill's mike. He's had it for years, and thinks the world of it. But he didn't seem to realize that even the best of mikes can wear on the screw point and anvil."

"Who discovered that, Al?"

"The inspector, Ed. He's a wise guy—sometimes. He took Bill and his mike to the toolroom, and showed him that it was worn a bit over two-thousandths. The good thing about it was that while the work must be done over, it isn't scrap."

"But where does Williams come in, Al? Seems to be a case of Bill Howard getting a new mike, or having his old one rebuilt."

"There's more to it than that, Ed. Williams don't want to have it happen again, and there's always a chance of anyone's mike getting off the key, so he's thinking about furnishing all the mikes in the shop, and keeping them in the toolroom. Check 'em out just as you do a drill or gage."

"Means buying a lot of mikes, Al."

"Yes, Ed, but the cost of regrinding those pins will pay for a bunch of 'em. Then it's the toolroom man's job to keep all the mikes adjusted right. That's one thing the standard gage blocks are for, you know, Ed. Then if a poor mike gets out in the shop, he'll know right where the trouble lays."

"But suppose a new man uses his own mike before he knows that the toolroom supplies them, Al?"

"That'll be our fault then, Ed. That's one of the first things for us to tell a new man. And I'm guessing there's a lot more we ought to tell them that we don't."

Who was really responsible for Bill's work being too large?

Was Williams wise in doing away with the private "mike" in the shop?

Was Al right as to foremen failing to inform men of shop facilities?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

Getting New Blood in the Shop

TEN years experience over a wide range has demonstrated conclusively that a vacant or newly created foremanship can be well filled from outside specialists in case that qualified men for the position cannot be found in the shop. These outside foremen must, of course, be able to show a similar and successful experience. At the same time it has been found successful to take foremen from the outside who have had earlier experience in the same work and whose qualifications, therefore, were known. With these men good results were generally obtained, since in changing about they had obtained valuable experience. The foreman from the outside, because of his wider experience in other shops, does not bring retrogressive methods to his work as is sometimes observed in foremen who have come up from the same work. This broader experience of the new man also gives him the advantage that he observes the work unbiased, and many times from other viewpoints, and can thereby point out better methods. It is, naturally, a stroke of good luck when a foreman can be found for the position who has the experience, ability, tact, and administrative qualities. When a foreman is brought in from the outside the aspiring and skillful workmen will either force their own ideas through or they will seek other positions. The other workmen are likely to be indifferent, but nevertheless it is a mistake to shut off claims to the foremanship from the workmen of the shop. Advancement must actually be arranged for by foremanship courses through which the firm recognizes the importance of building up the young blood of its own workmen. —MAX SCHONFELD, *Germany.*

Looking Beyond the Department

ONE of the outstanding points of efficiency in a factory is to have the heads of the various departments so familiar with the methods of operation on the finishing of the product, that each department is not only working to increase his production at a minimum cost, but is using his knowledge to plan the work of his department in such a way that it will lighten the work in the next department as much as possible.

The up-to-date management will see that the heads get together in meetings to discuss the problems of the different departments. A slight change in the product may mean a saving in the handling of one department, but the same change may increase the cost in another department. In one plant they not only held weekly meetings, but once each month the heads of departments were required to make a trip through all departments to familiarize themselves with the methods of procedure. Any ideas coming to the different heads on these trips were discussed at the meeting which was alwas attended by the management in order to create a feeling that suggestions were not criticisms.

H. M. CROOKS, *Master Mechanic.*

Should the Shop Govern Purchases?

THERE are three essential factors to be considered in settling the question of providing material: 1. The requirements of the finished job; 2. The requirements of the manufacturing process; 3. The cost of the material. No purchase of material should be made without a satisfactory answer having first been obtained to each of these questions. Taking Ed's proposition in the case in point, we see only two of these points considered. The purchasing department should never undertake any change in material, once that material has been specified by responsible parties in either the customer's or the manufacturer's technical organization. It should, however, be on the alert to secure proper material at a saving in unit cost, and in the event that the purchasing department seems to have a source of supply for material of the proper specifications, from whom supplies may be obtained at a reduced cost, this fact should be referred to the shop, which for its part should be willing to give a test or demonstration of the new material with a view to assisting in the general program of cost reduction. Such test, of course, should have nothing to do with actual production, which should continue with the original material always until everyone concerned is satisfied that a change can be made to advantage. In other words, this is just another case illustrative of the need for the full co-operation between every department of a business to the end that the general profits may be augmented, instead of the all-too-common practice of each department looking out only for the things that will serve to show up well its own record. —D. C. WRIGHT.

THE shop is naturally interested in ease of manufacture, and that class of material which gives the lowest shop cost appeals most to it. The purchasing department is interested in the class of material that can be bought at the lowest market price. Really, neither should govern. A third party, which can balance their ideas one against the other, taking into consideration, strength, serviceability and durability as well, such as the engineering department, should govern. However, in the absence of the third party, I decidedly favor the shop as the governing

THE · NEXT · TOPIC

Using Makeshift Tools

QUESTIONS

Does it pay to use makeshift tools on production work?

When are makeshifts permissible?

When do we save money by spending it?

agency. After all, it is the one that is responsible for the finished product, and as such should have control along with the responsibility. A purchasing department would not ordinarily possess the practical, technical, or shop knowledge necessary. If the designation of the class of material is left to the purchasing department, it is inviting constant bickering between the two parties on spoiled work, the shop will blame the material every chance it gets. —FRED J. SCHIMPF.

A MAN may be a clever shop executive, but a mighty bad buyer. It possibly requires just as much ability and training to fill the position of taking charge of the purchasing department as to supervise production. Of course, there should be co-operation between both departments, but each shall be run entirely separate. I believe a capable buyer in this case should have invited samples of brass from various makers, and sent some along to the shop to be tried out, before deciding who should get the order. —ARTHUR SILVESTER.

IF WE find in certain instances that the purchasing office does not buy the most economical material, but merely the cheapest, we should analyze the particular incident for cause, rather than consider curtailing the purchasing agent's authority and usefulness. The shop man naturally thinks in terms of brands or trade names, and once he has found a satisfactory source of supply for material, he is inclined to consider the problem solved and pay the price asked if it is at all within reason. The purchasing department naturally tends to buy that which is cheapest and in conformity with requirements.

So I feel the first consideration is a properly worded specification that tells what is wanted, so that everyone can understand it. This description may take many forms, chemical composition, physical properties, test requirements, and working properties. Once properly defined, price just naturally falls in line not as the first but as the final consideration.

Theoretically speaking, technical service furnished by the seller should be eligible for payment. Practically, in present-day competition it resolves itself into a form of service chargeable to advertising. Its goodwill creating possibilities are not to be overlooked.

—FRANK M. TUOHY.

Arguing with the Big Boss

THE Big Boss usually has all his capital in his company, and has got there by his ability, and when he insists upon the job being done in his way the foreman should quit arguing, get on with the job and endeavor to get out a rig-up that will do the work.

—W. WELSH, *England*.

THIS subject, like so many other, depends on the personality and temperament of the Big Boss. If he is autocratic and unwilling to hear or see any views but his own it is best for the foreman to follow, without question, his instructions. In other words, "give him enough rope and he'll hang himself." Fortunately this type is rare, and any chief worthy of the name will listen to those directly under him.

The fact that the foreman proves his case so thoroughly, shows how necessary it is for a chief to listen to the man directly in touch with the problem on hand, as he is able to see many minor points well worth consideration, but which may easily be overlooked in a casual examination. Again, for a chief to ignore his foreman's opinion, is not crediting the foreman with the foresight and discretion which gained him the position, and creates bad feeling between the two. This in turn is reflected throughout the whole shop.

—E. J. SMITH, *England*.

ARGUING with the boss depends on the boss. If he has any common sense, is not too puffed up with his own importance, and has sufficient knowledge of what you are talking about to understand what you are saying—go to it. But be sure you are right before you begin.

If the boss is the nephew of the owner, or is engaged to the owner's daughter, it will be all right provided you have selected a soft spot to fall on. But then, if he is that kind of boss perhaps it is better to jump out on the before-mentioned soft spot and forget the argument.

Then again, arguing may mean merely discussing without taking sides, or in its more strict sense it involves taking sides very definitely. In the latter sense an argument with a superior entails opposition to his ideas or wishes which may even be considered insubordination. Therefore once more, it depends on the boss.

—ENTROPY.

A FOREMAN is placed in charge of certain operations and is supposed to be expert. If he is ordered to perform work in a way he knows to be poor, surely he is only right in making objections and at least stating his case. Of course, the whole thing hinges on the foreman's duties; in some shops he is merely in charge of a gang of men as far as discipline is concerned, all methods being furnished by a planning office. In that case all he can do is to suggest a different method to the planning office and hope for the best.

—T. GEE, *England*.

Consulting the Foreman on Tool Design

JIG and fixture designs should certainly be submitted to the foreman. He is most familiar with the machine equipment of the shop, and particularly the condition of the various machines and the work load they generally bear. He can often give valuable suggestions as to which machine is best suited in condition and availability for a new jig or fixture. He also knows the availability of tools necessary to manufacture a given jig or fixture, and so can often save time and money on this phase of the problem. In addition he is familiar with available materials, and can give advice on this point, particularly if the tool designer is a new man in the organization.

In jig design, the foreman is often quick to recognize wherein a given jig by a little modification may serve a dual purpose, or where an existing jig slightly modified may serve in place of a new one. In fact, minor jigs may well be left to the foreman's ingenuity to devise them out of existing equipment at a considerable saving.

—JAMES P. CONNOR.

Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upward, depending upon their merit.

A Convenient Tray for Tools

By Lewis H. Kenney

The troublesome problem of providing the necessary cutting tools for machine tools where they will be easily accessible by the operator, yet guarded against loss, has been solved by the tray developed and used by George J. Costello, master machinist, Navy Yard, Philadelphia.

In Fig. 1 the tray developed for a lathe is shown closed and locked. The operator is provided with a key for the lock and he is charged with the tools and equipment stored in the tray. The top when in the closed position, locks in place the oil can at *A* and a can *B*, containing lard oil to be applied by a brush for thread cutting. Pockets are made for the various tools and each tool must be stored in its proper pocket. The woven-mesh top enables one to determine at a glance what tools are stored in the tray, and an empty pocket indicates that a certain tool is missing.

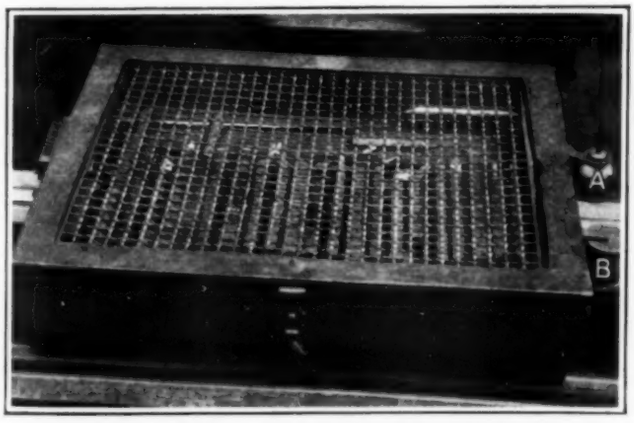


Fig. 1—The tool tray closed and locked

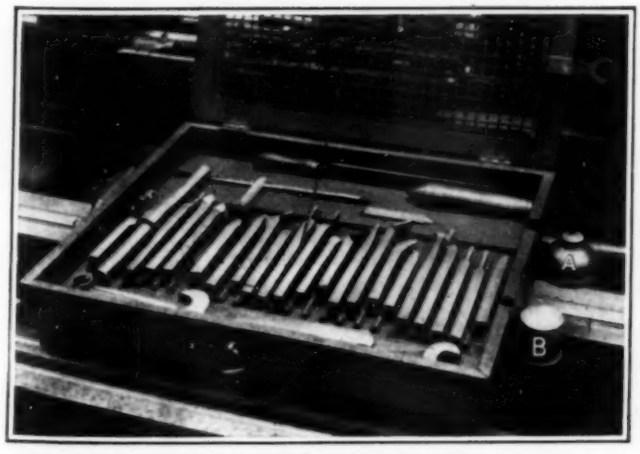


Fig. 2—The tool tray open

In Fig. 2 the tray is shown open and more clearly illustrates the assortment and arrangement of the tools. A spare lathe center is stored in the tray and is replaced by a reground one as often as required.

The tray has proved to be very serviceable, in that it provides the operator with the proper outfit for the day's work, and eliminates the loss of time required to visit the tool room for the proper tools. The replacement of broken down by newly dressed tools, filling of the oil cans, and so forth, is done by a helper who makes a round every morning.

Fixture to Hold Taper-Shank Reamers —Discussion

By Jack Williams

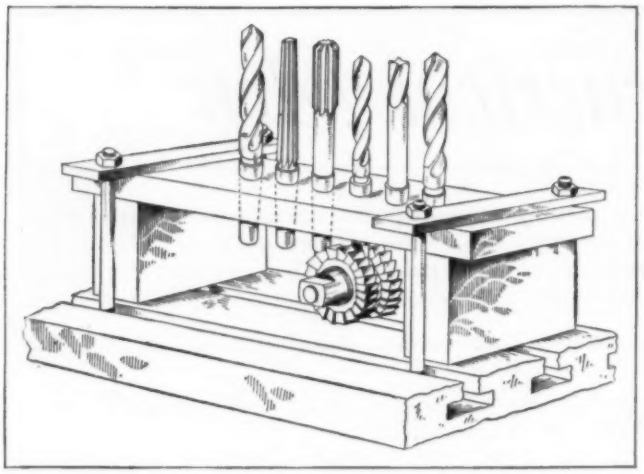
In an article under the title given above, on page 941, Vol. 66, of the *American Machinist*, James McIntosh evidently does not take into consideration the circumstances under which Herbert M. Darling, writing upon the same subject in an earlier issue, probably designed his simple fixture.

The method described by Mr. McIntosh is an excellent one. To my personal knowledge it is employed by manufacturers who turn out taper-shanked tools in thousands. Its disadvantage to the casual worker who has but a few dozens—or, at most, hundreds—of the tools to make, lies in the fact that it involves an elaborate fixture, amounting almost to a special machine, that would cost more than the value of the whole job, while Mr. Darling distinctly states that $25 covered the cost of his fixtures.

Given the milling machine, which is essential to either method, I have a scheme that involves even less expense than Mr. Darling's fixtures and is quite as effective if not more so. My fixture would consist of a single piece of rectangular- or square-sectioned stock (cast iron or cold-rolled steel will do nicely) with a row of taper-reamed holes closely spaced along its length, the taper of the holes corresponding, of course, to that of the shanks to be milled.

If the milling machine available has its spindle horizontally disposed, the fixture is mounted on the table with suitable blocking under each end, high enough to allow the pair of straddle mills to revolve between it and the table, with a little additional room for height adjustment. Ordinary straps and T-head bolts serve to hold it in place, but the center line of the row of holes must be adjusted accurately parallel to the travel of the table.

The sketch shows the principle. The operator has only to set a tool to be milled in each of the tapered



Fixture to hold taper shanks for milling the tangs

holes and bat it lightly on the tip end with a lead hammer. A small pinch bar and a suitable block for a fulcrum will assist in taking out the tools after the tangs have been milled.

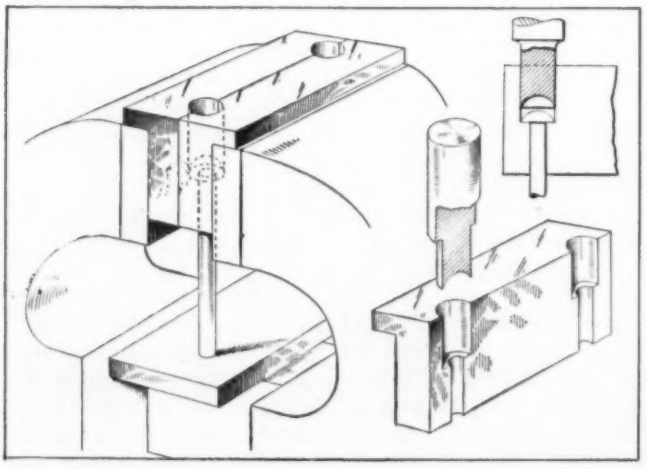
If a vertical spindle milling machine is handy the set-up is even simpler, since the bar with the holes in it may be laid on its side and need not be blocked up so high.

Heading Long Aluminum Rivets

By Herbert Crawford

Long aluminum rivets, or tie rods, are used in Cuba to fasten asbestos and other shingles to the steel roof trusses of buildings. Aluminum is used on account of its non-rusting qualities.

The rivet blanks are cut from rods and are headed in a vise, using a pair of special clamps attached to the



Tools for heading aluminum rivets

vise jaws and a suitable punch, or header, as shown in the sketch. The punch is a good fit in the openings of the clamps, which act as guides.

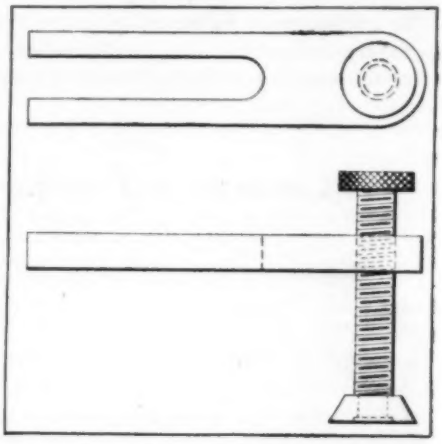
The clamps hold two rivet blanks, which are dropped in place and rest on a plate on the vise beam. The holes in the clamps are far enough apart to allow the blanks to straddle the vise beam, in case very long rivets are wanted.

Although this method of making rivets may seem like a slow one, one man heads 1,500 rivets in 9 hr. The device is used by the Darden-Beller Co., Havana, Cuba.

Handy Straps for the Toolmaker—Discussion

By Charles Kugler

The article by H. L. Wheeler, under the title given above and published on page 220, Vol. 66, of the *American Machinist*, leads me to believe that the readers would be interested in a pair of clamps that I have had for many years. These clamps will pay for themselves in a short time, since a toolmaker loses so much time in looking for blockings of suitable height. The adjusting screw eliminates this difficulty. The clamps, one of which is illustrated, were made out of machine steel and were pack hardened. Dimensions are a matter of opinion, but mine are made 3 in. wide, 1 in. thick, and 9 in. long. The screw is 1 in. in diameter and 9 in. long, and has eight threads per inch.



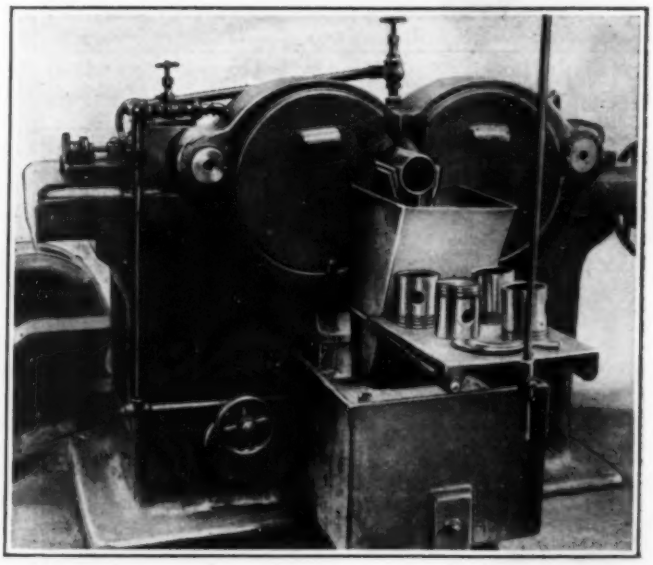
Handy clamps

Adapting the Centerless Machine to Grind Pistons

By John W. Leahy

The centerless grinding machine can be adapted to grind the pistons of automotive engines with so little difficulty as to make it advantageous to grind even so small a quantity as a set for one engine. All that is necessary is to provide a guide to hold the pistons on the rest in position to enter between the wheels.

First the pistons are ground all over by the method usually employed to grind round work, allowing them to



Grinding automotive pistons on the centerless machine

feed through. If much stock is to be removed it is advisable to pass them through several times, setting in the wheel after each lot has been ground until the diameter is right.

To grind the lands between the ring grooves, a stop is secured to the rest in such position that the pistons can enter between the wheels only so far as is necessary, and the operation is conducted by laying the piston on the rest and allowing it to feed in until arrested by the stop, when it may easily be lifted out. The grinding time is so short on this latter part of the operation as to be limited only by the operator's dexterity in placing and removing the work.

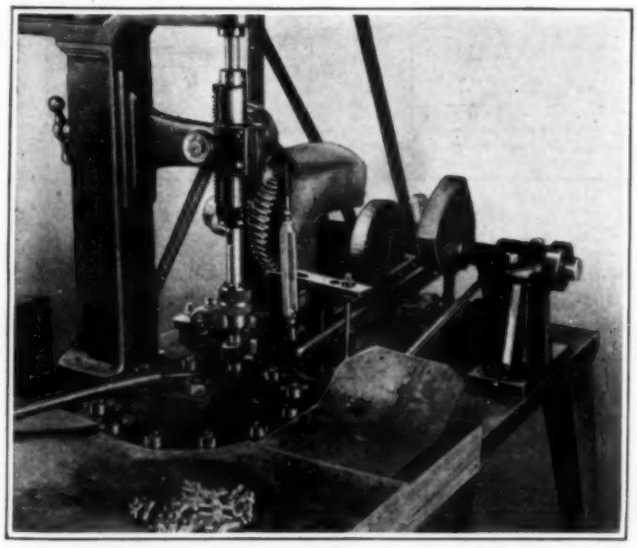
Dial-Feed for Drill Press Made from Scrap Parts

By Amos Ferber

We used often to hear of wonderful mechanisms made of parts that were taken from the scrap pile, but unless one has a most extraordinary collection of junk in his shop, such contraptions are likely to cost more than a new and special machine, or else to prove themselves so inefficient in operation that any saving in first cost is far overbalanced by loss in production. The device shown in the illustration herewith is one of the few exceptions.

The central feature is a standard sensitive drilling machine, far from being scrap, in which no change was necessary except to substitute for the regular finger feed lever, a shorter one made from a piece of rectangular stock. With the exception of the dial and its ratchet, the remaining parts were actually taken from an old special machine that had become worn out and scrapped.

The work to be done is drilling and countersinking a quantity of small wing-nuts of bronze, for which the shop had an order the size of which did not warrant the purchase or construction of an elaborate special machine. The dial was fitted with short slotted bushings to hold



Home-made automatic drilling machine

the work, the old machine with its camshaft and worm drive was moved to position beside the drill press, and the connecting levers were made out of whatever parts were handy.

A corner was cut out of a wooden bench to clear the dial, which revolves upon a stud set into the table of the drill press, and a sheet of metal nailed to it, overlapping the dial, so that work pieces would not fall between it and the latter to jam the movement. One cam operates the reciprocating motion of the drill-press spindle and the other indexes the dial.

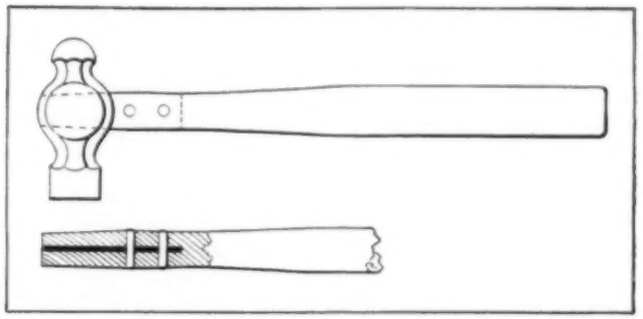
The speed of production is limited only by the operator's ability to keep ahead of it. The wing nuts have merely to be dropped into the slotted bushings and require no other means of holding them. The drill and countersink is a single tool. There is no automatic ejector on the device, but the proprietor threatens to put one on if he can only find the necessary parts in the scrap pile.

Reducing the Breakage of Hammer Handles

By Richard H. Kiddle

A lot of hammer handles were being broken in the shop, so we tried the following method to lessen the breakage:

We cut a saw kerf in the end of the handle and inserted a piece of $\frac{1}{16}$-in. sheet steel, riveting it in place



How the hammer handles were strengthened

as shown in the illustration. The edges of the steel and the ends of the rivets were dressed down flush with the wood. Since fixing the handles in this way, the breakage has been almost negligible.

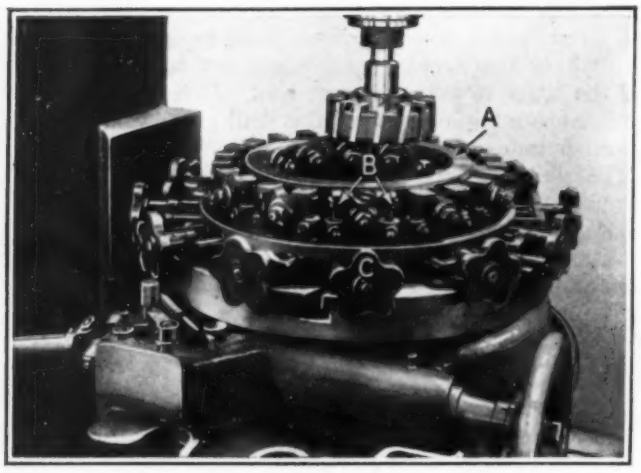
A Continuous Milling Fixture

By John Stewart

The illustration shows a fixture that was made to go on a rotating table to be used in any milling machine having an upright spindle. The work for which it was designed consists of small cast-iron brackets, the shape of which may be seen in the picture. The fixture permits milling to be carried on continuously, the operator unloading and reloading the work at any point away from the milling cutter.

The fixture consists of a circular casting, cored out beneath to combine lightness with rigiditiy, and having an annular, projecting hub *A* from the wall of which twelve equidistantly-spaced studs project radially outward. The studs are of such size as to fit closely in the reamed holes in the work-pieces, and each stud terminates in a threaded part sufficiently smaller in diameter to allow its nut to pass through the hole in the work-piece.

The work-pieces are clamped on the studs by end pressure by merely dropping slip-washers between them and the nuts, and tightening the nuts. Thus, in order to remove and reset a piece of work, all that is necessary



Work-holding fixture for continuous milling

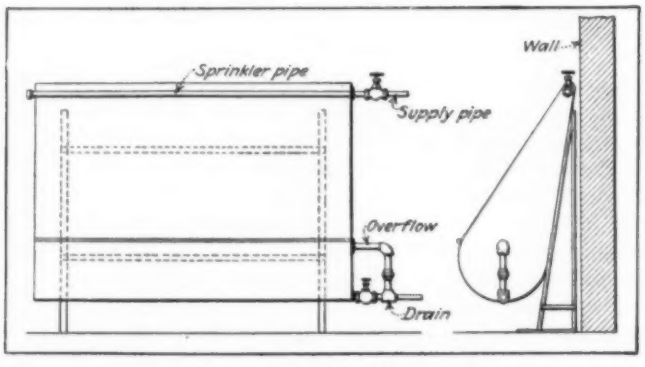
is to loosen the nut enough to allow the slip-washer to be lifted out, make the exchange, return the slip-washer and re-tighten the nut.

To level the work-pieces before tightening the nuts, and to support them rigidly under the pressure of the cut, two plungers as at *B* are provided at each station. The plungers are free to slide vertically, and their lower ends rest upon the parts of a forked wedge that can be moved radially inward by turning the large lobed disk, or knob, *C*, which is secured to a screw entering the base of the fixture. The forked wedge acting upon both plungers at once, thus equalizes the work-piece and insures that its milled lugs will be of the same thickness after the cut has been taken.

Blueprint Washing Tank—Discussion

By P. H. White

The blueprint washer described by Lewis Skeel on page 564, Vol. 66, of the *American Machinist*, suggests the one constructed by our company and installed in our drafting room. The illustration shows the general form and construction. It is made entirely of metal, the tank being of 20-gage galvanized iron, and the supporting



Tank for washing blueprints

frame of angle iron. The perforated sprinkler pipe at the top is of copper, so that it will not corrode and clog up at the small perforations.

The print is dragged through the water in the tank and then brought up under the spray where it sticks to the sheet-metal back. As soon as it has been thoroughly washed, the spray is turned off and the surplus water is wiped off with a squeegee, then the print is hung up to dry.

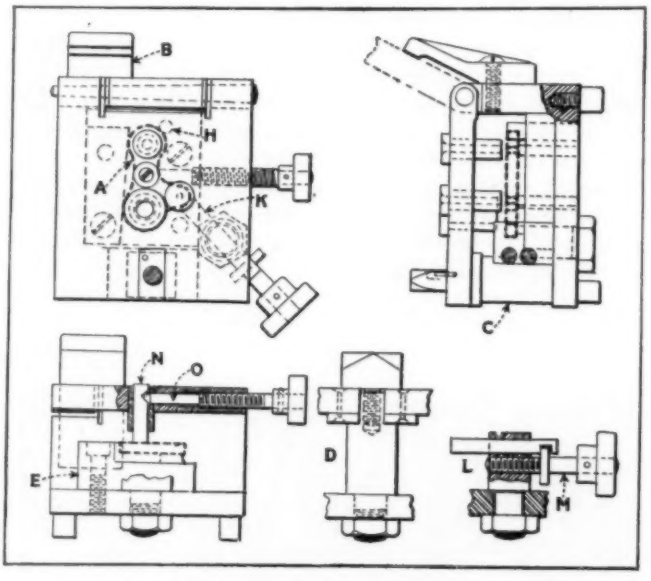
The arrangement of sprinkler, drain, and overflow pipes is shown in the illustration. This washer is particularly suited to the small drafting room.

Drill Jig for a Metal Stamping

By George H. Feltner

When the specifications for a metal stamping call for holes smaller in diameter than the thickness of the stamping itself, it is necessary generally to drill the holes rather than to pierce them, especially if accuracy is an important factor. The illustration shows an example of this kind in which the part outlined at *A* is $\frac{3}{16}$ in. in thickness, while the smaller holes are $\frac{1}{8}$ and $\frac{3}{32}$ in. in diameter, respectively. Inasmuch as drilling was required, it was considered advantageous to machine all the holes at one setting. Therefore, the $\frac{1}{8}$ in. hole also was drilled in the same jig.

The jig body and the leaf are machined all over, the leaf being hinged to the body by a tapered pin. Hardened washers are placed between the abutting ends of the hinged parts, so that what wear takes place can be compensated for by replacing the washers with thicker ones. The stop *B* keeps the leaf from falling backward



Drill jig for a sheet-metal part

when opened, and the post *C* supports it when it is swung to the clamping position. At *D* is a view of the locking arrangement, in which the post and the wear plates attached to the leaf are shown. The work piece rests on the block *E*, and is located by one side of the block and the pin *H*. It is held against these points by the pin *K*, shown in section at *L*. As will be seen, the pin is operated by a collar on the screw *M*, thus eliminating turning action at the point of contact, which often tends to shift the part being clamped, especially in cases where the part is small. The locating surface of the block on which the work rests, is profiled to correspond to the outline of the work piece. It is slightly smaller in size, however, so that wear will be distributed evenly.

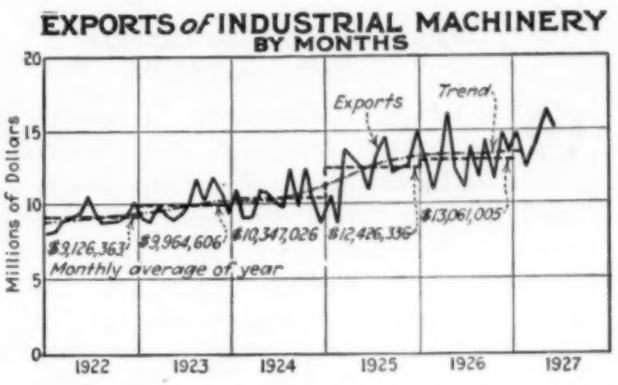
The pin *N* holds the part in place after the leaf has been closed. The clamp is actuated by the point of the screw *O* entering a V-notch cut in the pin, and bearing against the lower edge.

Activity in the Metal Working Industries

Operations Continue at High General Level

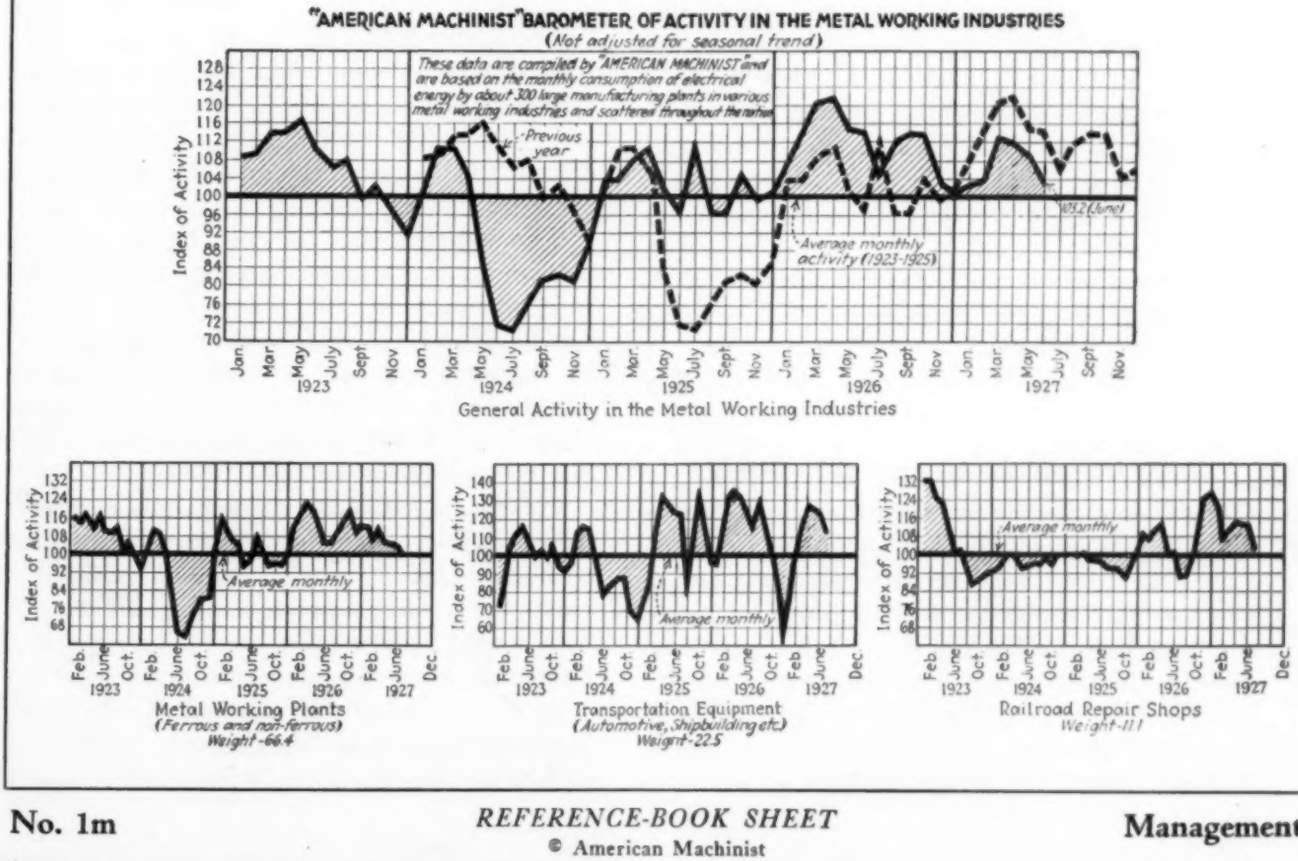
As was to be expected at this season of the year the operations of the metal-working industries taken as a group continued the downward trend in production which started in April. The production operations of these plants during June were about 6 per cent below those of May, and about 9 per cent below March, the month of highest productivity during the present year. June operations were about 12 per cent below the operations reported for June of last year, the operations of the metal industries having been below those of the same month of last year ever since January. The general trend of operations so far this year, however, has been very close to that experienced last year, only on a lower level. Despite this recession from last year, the industry is still operating at about 3 per cent above the monthly average for the 1923-1925 period. These conclusions are drawn from the statistics of electrical energy consumption of the metal-working plants as tabulated by the *Electrical World*.

According to data furnished by the Industrial Machinery Division of the Department of Commerce, shipments of industrial machinery from the United States during May showed an increase of nearly $3,000,000 over May, 1926, in spite of a large decrease from the record month of April. The total machinery exports during the month of May amounted to $15,103,000. Exports of machinery during the months



of April and May of this year exceeded those of any month since 1921, and shipments for the first five months of 1927 showed a gain of more than $8,000,000 over the corresponding five months of last year.

Shipments of oil-well machinery during the five months period ending in May amounted to $8,798,000, as compared with $6,211,000 for the corresponding period of 1926. During the same periods the exports of metal-working machinery have increased from $7,880,000 to $9,144,000. The largest gains, however, have been in unclassified miscellaneous industrial machinery, which have increased from $9,584,000 for the 1926 period to $12,634,000 for the period of 1927.


"AMERICAN MACHINIST" BAROMETER OF ACTIVITY IN THE METAL WORKING INDUSTRIES
(Not adjusted for seasonal trend)
These data are compiled by "AMERICAN MACHINIST" and are based on the monthly consumption of electrical energy by about 300 large manufacturing plants in various metal working industries and scattered throughout the nation
Previous year
Average monthly activity (1923-1925)
103.2 (June)
Index of Activity
General Activity in the Metal Working Industries
Metal Working Plants
(Ferrous and non-ferrous)
Weight-66.4
Transportation Equipment
(Automotive, Shipbuilding etc.)
Weight-22.5
Railroad Repair Shops
Weight-11.1
Average monthly

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Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

"Pushing Back the Borders of the Impossible"

ONE of the distinguished Frenchmen who honored Col. Lindbergh after his successful arrival at Le Bourget said to him, "Young man, you have pushed back the borders of the impossible." A wonderful phrase this, truly French in its aptness and vividness. The young American aviator and the other aviators who followed him over the Atlantic, not forgetting those who flew across the Pacific between the United States and Hawaii, did just that for aërial transportation.

Achievements such as these are needed by industry just as much as they are by transportation and communication. Certainly, radio has given the borders of the impossible, not a push, but a mighty shove.

Industry's attainments are not so spectacular but they are none the less valuable. The combination of welding and metal forming is revolutionizing the manufacturing methods in certain plants, and making possible results unheard of a few years ago. Centerless grinders are affecting reductions in production costs and times that sound almost unbelievable. Anti-friction bearings in machinery and in railway cars are changing preconceived ideas of starting torques and solving lubrication problems. These are only examples of the kind of thing that is going on constantly in industrial plants. They are commendable, essential, valuable, but there must be no let-up. As competition becomes constantly keener, more and more "impossible" feats must be accomplished so that the borders of that unknown land may shrink before the advance of brains and initiative.

Support for the Geneva Resolutions

THE hearty endorsement of the trade barrier conclusions of the International Economic Conference by the International Chamber of Commerce, assembled in Stockholm, gives reason for hope that the Geneva meeting will soon bear fruit. Moreover the vigorous support of this endorsement by all the national delegations at Stockholm constitutes a pledge that each group will go home ready to urge prompt action by its government in accordance with the Geneva-Stockholm resolutions as an essential first step in the improvement of national conditions. Certainly nothing can so speedily contribute to the revival of Europe. Such a revival is imperative. Should the movement started at Geneva fail, we would, as Sir Arthur Salter has said, have reason to despair. No other course is open.

At first sight the task would seem impossible because of the selfish national ambitions involved, but all European business men realize that the trade barriers erected for national self protection have failed to bring prosperity. Counter barriers have been erected and the flow of goods has been checked with resulting impoverishment at home. This "collective insanity," as Sir Arthur called it, is now recognized by all business men and by many statesmen. The business men must carry general conviction to the public and the governments.

There is good reason to hope for results aside from the selfish desire for better business. There is the larger impelling motive of improving conditions for the multitudes now suffering from a reduced standard of living. The need to relieve them is frequently expressed. With such motives and such forces in motion results must follow.

What Lies Behind Mechanical Achievement

EFFECTS always, and naturally, receive much more attention than causes. The notable trans-oceanic flights rivet our attention on the state of perfection attained by the modern aviation engine. We give great credit to the designers and builders, and rightly. But we are very apt to overlook the factors that have made such perfection possible.

The dependability of any highly organized mechanism lies largely in the methods available for its production. And the production of today's successful airplane engine has been made possible by the developments in modern machine tools. The accuracy necessary for its complete dependability could hardly have been secured with the machine equipment of ten years ago.

Clearances between cylinder walls and pistons must be just enough to allow perfect running without undue leakage. Space for an oil film must be provided between bearing surfaces. Too little means failure from lack of lubrication, too much may mean pounding and rapid wear.

In glorifying all our mechanical achievements it is well to remember that modern machine tools and skilled mechanics have made them possible.

Technical Abstracts

Pioneer Earth Inductor Compass

The successful flight of Col. Charles A. Lindbergh from New York to Paris and the accuracy of his navigation has caused considerable interest in the instruments he used, and particularly in the earth inductor compass to which he credits his great accuracy in navigation. The outstanding feature of the Pioneer compass is the separation of the magnetic element from the direction indicating element. The generator is the direction-determining element of the compass and is similar to any direct-current electric dynamo having an armature with commutator and collector brushes but using the magnetic lines of the earth as its field. A pair of brushes are connected to an electric galvanometer of the zero-center type. If the brushes are rotated around the commutator, it will be found that the indications on the meter vary from zero to maximum in one direction, back to zero, then to maximum in the other direction, and to zero again when the brushes are returned to the first position. If the armature is wound and connected to the commutator so that the points of zero potential are in line with the magnetism of the earth, the galvanometer will show zero only when the brushes are in line with the direction of the earth's magnetism. Therefore, when the galvanometer shows no indication, we know that the brushes are in line with the magnetic North and South.

The Pioneer earth inductor compass consists of three principal units: A generator, a controller and an indicator. The generator contains the armature, which is suspended in gimbal rings and driven by an anemometer or windmill. The generator brushes are mounted so that they may be rotated around the commutator. The stability of the armature is maintained by the action of its own gyroscopic force and the use of a suitable damping device. The controller is a purely mechanical device for setting the angle of the generator brushes to correspond to the desired heading. It is connected to the generator by a flexible shaft run through a flexible casing. Dials on the face of the controller show the angle through which the brushes have been orientated in relation to the airplane. The generator is usually mounted in the rear of the fuselage, with the anemometer projecting above the fuselage into the air stream. It may, however, be mounted at any place on the plane, even in the wing. The meter and controller are usually mounted on the instrument board in front of the pilot. On some large planes, however, the controller and a duplicate meter have been placed at the navigator's position, where he can set or change the course, the pilot merely steering to keep his indicator pointer on zero.

It is pertinent to point out that the errors which seriously affect the ordinary magnetic compass are all eliminated or rendered insignificant in the earth inductor compass, and much more accurate reading is possible with the earth inductor compass than with the magnetic type. The heading may be set to one-half of one degree, and departures of less than one-half degree from this heading are easily noted on the meter. This compass was used by the Round-the-World flyers, by Lieut. Maughan in his transcontinental flight, and by Col. Lindbergh.—Maurice M. Titterington, *Aviation*, June 20.

Lighter Diesel Engines

Development work on light, high-speed Diesel engines for the heavier classes of automotive work is being carried forward with considerable energy, especially abroad where the higher prices of volatile liquid fuel make the immediate outlook for this type of engine seem brighter than here. Two automotive type Diesel engines were exhibited for the first time at the Leipzic Spring Fair, one by the Krupp Co. and the other by the Junkers Motor Mfg. Co. The Krupp engine is built with both four and six cylinders, one developing 45-65 hp. and the other 70-100 hp., both at 700-1,000 r.p.m. These engines are designed chiefly for use on cranes, dredges, rail cars, motor-boats and trucks.

The engine operates on the four-stroke cycle, with jet atomization, by means of an open nozzle. It is sprayed through a fine nozzle under high pressure directly into the combustion chamber. Only gas oil, paraffin oil and lignite power oil are considered as fuel. The Junkers engine is a two-cylinder, double-piston type, and is rated at 40-48 hp. at 1,000-1,200 r.p.m. A test made of this engine by Prof. Nagel of Dresden showed a consumption of 0.38 lb. of fuel per horsepower hour.

Another development along this line is the Cummins engine, by the Cummins Engine Co. of Columbus, Ind., this being a development of the Hvid engine, in which a mixture of fuel and air is forced into the combustion chamber mechanically. A similar work is the Beardmore heavy oil engine, by A.E.L. Chorlton. This engine has been manufactured particularly for rail car use in six- and eight-cylinder types. Each cylinder is 8¼x12 in., and develops 50 hp. at 750 r.p.m. The weight of the six-cylinder, 300-hp. engine is about 13 lb. per horsepower.—P. M. Heldt, *Automotive Industries*, June 18.

The Universal Language of 0.001 In. in the Mechanical Arts

Many people hold a strong conviction that the arbitrary units of measurement of the metric system—closely and logically related though they are as units of length, area, volume and weight, and ideal as they may seem—are not practical as units in many of the arts. Many practical men are of the opinion that the present system of measurement lends itself through its flexibility, like the English language, to the widest usefulness.

Another aspect of the metric system is the decimal system. There is no valid argument against the usefulness of the decimal system, but the metric system has no exclusive claim on the decimal system since it is now used exclusively in designating all measurements of exacting importance.

Few people think abstractly. Most people think in terms of their language. Men living and dealing in the mechanical arts and trades think in terms of measurements in which they have been trained or educated. A mechanic or draftsman or engineer can draw a line 1 in. long within a small margin of error. He cannot draw 0.001 in. because it is too small, but he will tell you that a hair is between 0.002 and 0.004 in. or that a tissue paper is about 0.003 in. He knows and feels in 0.001-in. dimensions.

All machinery depends for successful operation on clearances between the moving surfaces, and these clearances must be exact. I have used the metric system for 25 years in general dimensions, but I cannot yet think in it and I find I have to convert from one system to the other. Generally speaking, 0.001 in. clearance per in. diameter of a shaft is a good rule the world around in mechanism. One reason the inch is such a good unit is because 0.001 in. is such a happy unit for use in clearances.

The compulsory adoption of the metric system is a fallacy comparable to the problem involved in the enforcement of the Volstead Act. The present system is so ingrained it would be impossible to enforce the metric system if made compulsory by law, for quick adoption. If it is ever adopted it must be accepted on its merits and must not be forced down the throats of industry and trade. The adoption must be an evolution of two centuries at least; not a revolution of a generation or any similar period.

My opinion is that the English system will survive because it is the best. It is practical for more uses than the metric system, ideal as the latter may be.—H. L. Horning, *Weights and Measures*, July.

Shop Equipment News

Newton Improved Rise-and-Fall Milling Machine

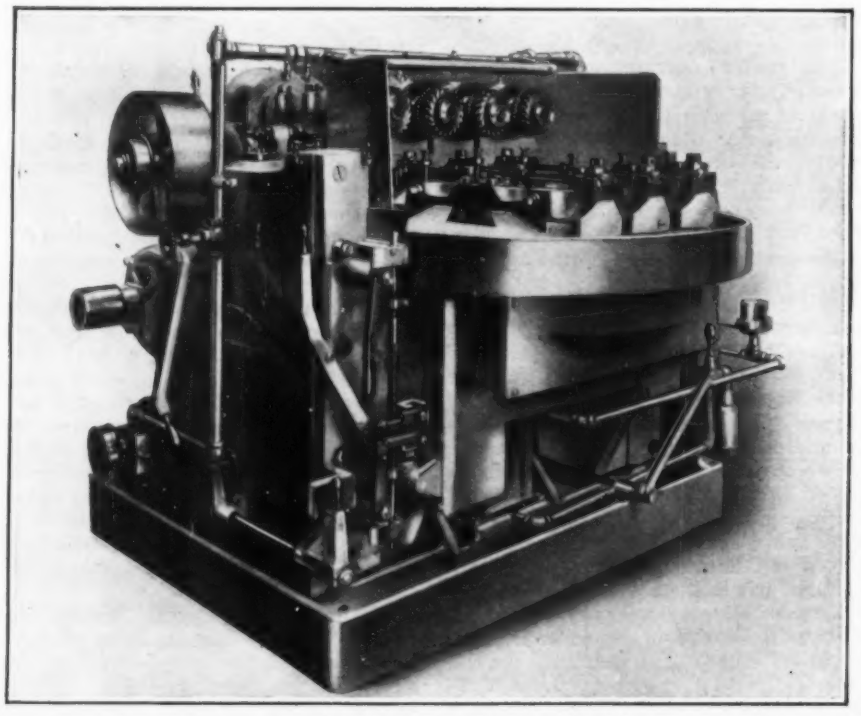
THE improved rise-and-fall milling machine shown in the accompanying illustration was recently built at the Newton Works of the Consolidated Machine Tool Corporation of America, Rochester, N. Y., for slitting caps and milling bolt bosses on automobile connecting rods. The improvements were designed to increase production by approximately 40 per cent. Simplified control by levers and minimum floor space are other features of the design.

The spindles are now provided with precision Timken roller bearings, and each of the four heads is separately adjustable horizontally to vary the center distances. The table gibs are located in line with the cutters and also in line with the center of gravity of the table. This construction is said to give smoother feed action and greater rigidity. The gibs are entirely protected from cutter coolant and chips, both of which pass through the base to a pan in back, where the chips can be removed.

The table is provided with a vertical Oilgear feed and rapid traverse movement. The feed rate can be quickly adjusted by a screw on the oil pump. The rapid traverse movement is said to be much faster than on previous machines, and the length of travel can be varied by adjustable dogs on the side of the knee. In this way the machine can be quickly set up for different sizes of connecting rods. The only mechanical change necessary is in adapting the fixture to suit the particular rods.

The table is also provided with power indexing movement controlled by a hand lever. Two sets of three fixtures each located 180 deg. apart are mounted on the table so that the operator can load one set while the cut is being taken on the other. The table is fixed in either of these positions by a heavy taper index pin which is held into a taper brushing by a heavy spring. This plunger is connected to a hand lever so that the operator can disengage the plunger during the power traverse of the table. A pin on the side of this hand lever interlocks with a plate on the machine upright in such a manner as to prevent the index pin being pulled out while the cutters are in operation.

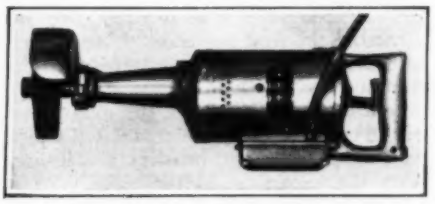
It is said that extreme care has been taken to provide accurate alignment of the table and saddle units in relation to the machine and that all bearings are carefully provided with positive means for lubrication.



Newton Rise-and-Fall Milling Machine

Automatic Switch for Clark Hand Grinders

The Jas. Clark, Jr., Electric Co., Louisville, Ky., has adapted its automatic switch to its line of hand grinders. The mechanical details of the switch are identical with those used in the portable drills made by this company. The same hand that is used to guide and support the tool is also used to manipulate the switch, so that as soon as the grip is released the motor stops.



Clark Portable Electric Grinder With Automatic Switch

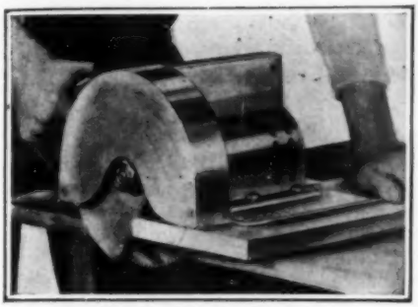
Three sizes of portable grinders are equipped with the automatic switch: the No. 00, having a 4x1½-in. wheel; the No. 0 with a 4x1-in. wheel; and the No. 1 with a 5x1-in. wheel. These tools are used in general for removing burrs from castings, smoothing off welds and the like.

Lee Portable Electric Saw

The portable electric saw illustrated is being marketed by the Lee Pattern Co., 130 13th St., Milwaukee, Wis. It will cut lumber up to 1 in. in thickness, and one of the chief claims made for the machine is its lightness and convenient size. It weighs 6 pounds.

The machine is primarily a one-handed saw, so that the operator can use his other hand to hold down the lumber. Due to its shape, it can be

Shop Equipment News



Lee Portable Electric Saw

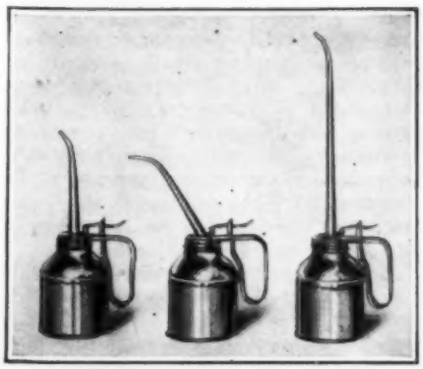
laid down on any of four sides without rolling over. All parts are made from stampings, resulting in a low cost.

The saw is equipped with an automatic guard that is said to insure safety at all times. If necessary, this guard can be changed for the use of a left-handed workman. A patent ridge is provided for gripping the machine in a vise, so that it can be used as a regular bench saw. This vise grip can also be used as a hand grip for pushing the saw through the work.

Plews Positive-Pump Oilers

The Plews Oiler Co., 405 Boston Block, Minneapolis, Minn., has brought out a line of positive pump oilers. It is made in six styles and sizes, ranging from ¾ pint to 1 quart in capacity. It is said to positively pump light or heavy oil in warm or cold weather, and will exert a pressure at the spout of 100 lb. per sq. inch.

The cans are made of steel, copper plated. The pump action is controlled by a thumb lever mounted on top of the handle. No valves or washers are used in the pump, nor does it rely upon air pressure or suction. Instead, the pump action is by telescoping tubes with ball valves in the bottom of both the movable and the stationary tube. Upward movement of the outside sleeve forces oil into the upper chamber, which is constantly filled with oil by reason of the ball check valve. The position of the outside movable tube is such that the can be practically empty before the container pump will cease working. The quantity pumped is controllable.



Plews Positive-Pump Oiler

Hayes Globar Electric Furnace

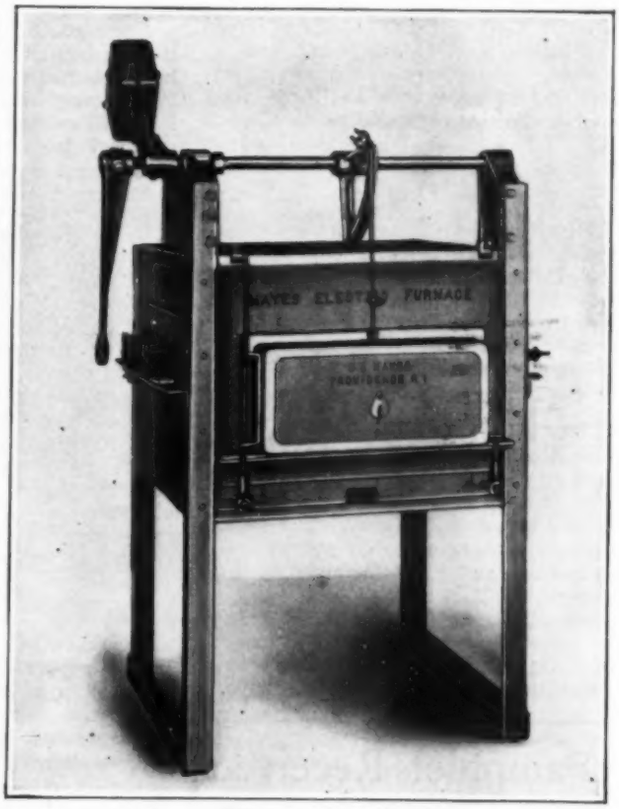
THIS Globar electric furnace has been particularly designed for hardening high-speed steel. It is made by C. I. Hayes, 129 Baker St., Providence, R. I. Temperatures ranging from 1,800 to 2,500 deg. F. can be maintained continuously, and up to 2,800 deg. F. in intermittent service. The furnace is of the resistance type. It may be operated on either alternating or direct current at voltages up to 220, or on a.c. lines only, voltages as high as 550 may be used.

The inner lining of the furnace is made of a special molded "Carbofrax" capable of withstanding temperatures of 3,000 deg. F. or over. This is backed up with several courses of heat insulation, including Sil-O-Cel and high pressure block, all inclosed in a boiler plate casing.

The heating elements are in the form of rods and may be mounted in the top of the heating chamber, under the hearth, or in both places, depending upon the design of the furnace. They may also be mounted along the side walls from front to back. The heating elements, or Globars, are supported between two special alloy bars or terminals which extend out through the side or end walls of the furnace. These carry the current to the heating element and contact is maintained by spring pressure applied to one of the terminals from the outside.

Furnace temperatures may be controlled either by hand or automatically. For the hardening of high-speed steel, atmospheric conditions can also be positively controlled.

The furnace is made in two standard sizes: Type HG 1 has a chamber 4 in. high by 8 in. wide by 12 in. long, while Type HG 2 has a chamber 6x10x18 inches. Complete equipment consists of furnace, transformer and automatic control apparatus. Cleanliness and economy of operation and upkeep are claimed.



Hayes Globar Electric Furnace

Trade Catalogs

CONTROLLERS, DRUM. The General Electric Co., Schenectady, N. Y., has issued Bulletin GEA-743 on the CR3202 series, drum controllers for two- or three-phase slip-ring induction motors. The publication contains four pages and is illustrated with photographs showing

various features. A wiring diagram is also included.

CIRCUIT BREAKERS. The General Electric Co., Schenectady, N. Y., describes its solenoid-operated air circuit breakers in Bulletin GEA-780. The chief constructional features are pointed out with the aid of photographs. The publication is in leaflet form.

MEASURING INSTRUMENTS. The Comtor Company, Waltham, Mass., has issued publication J on the Comtorplug and publication K on the Comtorgage. Both circulars are illustrated and together describe the complete line of instruments developed for production and inspection measurements of outside and inside diameters. These publications are well illustrated with photographs of the devices described.

MOTORS, ELECTRIC. The Century Electric Co., St. Louis, Mo., has issued two bulletins on its equipment, one describing the split-phase induction motors and the other two- and three-phase double squirrel-cage induction motors. Both circulars are illustrated and in them the general constructional features are pointed out.

RUNWAYS. Herbert Morris Incorporation, Buffalo, New York, has published Book 106 on its overhead runways. The pamphlet contains twenty-four 6x9 in. pages and is profusely illustrated throughout with photographs showing various applications of this type of industrial conveyor system.

TOOL STEELS. The Carpenter Steel Co., Reading, Pa., recently issued a booklet on its tool steels for hot work. The problem of shaping or forming hot metals by punching, shearing, bending, upsetting, swaging, piercing, drawing, extruding and moulding is first presented, and it is then shown how three types of Carpenter alloy steels are able to solve these problems. An analysis of die failure is also given. The booklet contains twenty-four 4½x6½-in. pages.

Pamphlets Received

EMPLOYEES MUTUAL BENEFIT ASSOCIATIONS. The Policyholders' Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York, N. Y., has published Report No. 58 under the above title. The purpose of such associations, the means of organizing them, the various types of plan, membership, administration, funds, insurance benefits, medical benefits, supervision of employee activities are all described in detail. Seventy-five firms throughout the United States and Canada contributed their experiences to this report. The publication contains twenty-eight 8½x11-in. pages and is attractively arranged.

EMPLOYEE REPRESENTATION OR WORKS COUNCILS. The Department of Manufacture, Chamber of Commerce of the United States, Washington, D. C., has published a 44-page pamphlet under the above title, by Robert H. Spahr. The first part is devoted to defining employee representation. Objectives are then discussed, followed by a description of the types of employee representation. The activities of work councils in actual operation and the favorable or unfavorable experiences that have occurred are then related. The pamphlet contains a general summary and an appendix of data from twenty representative companies.

MACHINE DEALERS. The American Machinist, 10th Ave. & 36th St., New York, has published a list of machine tool and machinery supply dealers in the United States indexed by states and cities in alphabetical order. The various dealers are keyed as to whether they carry machine tools, machine shop supplies or both.

PACKING, HARD FIBER SHEET. The Bureau of Standards, Washington, D. C., has published Circular No. 335 on U. S. Government Master Specification for Hard Fiber Sheet Packing. It may be obtained from the Superintendent of Documents, Government Printing Office, Washington, for 5 cents.

PRONE PRESSURE METHOD OF RESUSCITATION. A limited number of copies have been printed of the paper under the above title by Sydney W. Ashe, Pittsfield Works, General Electric Co., delivered before the New England Section of the National Electric Light Association, April 22, 1927. The paper represents about fifteen years of study on the subject and it is useful as a text for instruction purposes. It is graphically illustrated with photographs of applications to skeletons. Electrical, drowning, gas and suffocation cases are treated in turn. A few copies of the pamphlet, which contains eight 8x10½-in. pages, may be obtained from the author.

WATERWAYS. The Jones & Laughlin Steel Corporation, Pittsburgh, Pa. has issued a pamphlet entitled "Our Runaway Rivers, Put Them to Work." It is illustrated with over sixty photographs showing various types of craft in use on inland waterways. The booklet reviews the present situation in river transportation, including packet service on Western rivers. A plea is made for further use of this method of shipment. The photographs show how large steel and oil companies and other big shippers are putting to work the 9,000 miles of waterways in the Mississippi system.

MEASURING TAPES. The Bureau of Standards, Washington, D. C., has published Circular No. 328 on the testing of measuring tapes. The pamphlet contains sixteen 7x10-in. pages and is illustrated with both photographs and line drawings. Standard tapes are first explained, and then a general description is given of the geodetic comparator and the procedure used in testing geodetic tapes. The publication may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents.

Railroads Equipping with Control Devices

A total of 7,316 miles of railroad and 5,600 locomotives have been equipped with automatic train control devices under orders issued by the Interstate Commerce Commission.

The original order directed 49 of the larger railroads to install such safety devices upon a full passenger locomotive division each, and the second order required 47 of the original list of 49 carriers to make installations on another division. The effective dates have been extended at various times and some roads have been exempted from the orders, so that the first now applies to 44 roads, of which all but two have completed their installations.

The second order now applies to 36 roads, of which all except nine are reported to have completed their installations. The effective date of the order was July 1, but shortly before that date the Commission granted an additional extension of time for the nine companies to Dec. 31 in all cases except that of the C. I. & L., which was allowed to Dec. 1. The nine roads allowed further time are the Central Railroad of New Jersey, the Chicago, Indianapolis & Louisville Ry., the Delaware & Hudson Co., the Delaware, Lackawanna & Western R.R., the Erie R.R., the Lehigh Valley Railroad, the Long Island R.R., the New York, New Haven & Hartford R.R., and the Reading Co. The total road mileage covered by the two orders was 8,359.8, of which 7,316 had been completed to June 1, the date of the latest compilation of the reports, and 6,942 locomotives of which 5,600 had been equipped.

Mining Contributes Half Freight Shipments

A fifteen per cent increase in the tonnage of mine products was the brightest spot in the railroad statistics for the first quarter of this year. During that quarter mines contributed 165,897,128 tons to the revenue freight of the Class I railroads. This compares with 144,777,582 tons in the quarter ended March 31, 1926.

On the other hand, there was a decrease of 6 per cent in the tonnage offered by the forest products industries; a decrease of 4.33 per cent in less-than-carload freight and small decreases in the tonnage offered by manufacturing plants and by those engaged in stock raising and the manufacture of animal products. The only other commodity group which showed an increase in the amount of freight originated was agriculture. The increase in shipments of agriculture was 4.45 per cent.

The total tonnage handled by the railroads during the first quarter of 1927 was 299,915,665 tons. In round numbers 55 per cent of all freight was contributed by the mining industry. The figures are those of the Interstate Commerce Commission.

NEWS OF THE WEEK

Air Travel in Germany a Business Built on Practical Economics

Seventy-four air routes connect fifty cities daily

By Edward J. Mehren

Vice-President, the McGraw-Hill Publishing Company, Inc.

Duesseldorf, June 16, 1927—In America, the airplane is a factor in everyday life as it expedites our letters. In Germany, air service is a regular daily public-service enterprise. Seventy-four routes are covered by the planes of the Deutsche Luft Hansa, while joint operation with foreign corporations extends the network far beyond German borders. Fifty cities within Germany are connected by daily airplane service, and the network has a length of somewhat over 20,000 km., or 12,000 miles.

This year the service has been extended over that of last, but over last year's network 3,800,000 plane miles were covered, and 56,268 passengers and 2,076,000 lb. of freight, baggage and mail carried. It will be seen, then, the German air service is a well-developed enterprise, playing an important part in the business life of Germany. And be it said, that the end is not yet. Big developments are doubtless ahead in German commercial aviation, within Germany and without. Her technical progress must necessarily result in her air-traffic operators and plane builders being called outside her boundaries for both machines and operation while the popularity of the service at home has grown rapidly.

What impresses the foreign user of the German air service is the business-like procedure of the whole thing. Buying one's first air ticket is apt to be a bit of ceremony for the buyer. Thoughts crowd on one: How safe is it? Should a plane fall, what then? Suppose there should be a bad storm?

But there is no ceremony about it for the ticket agent. For him it is a regular procedure. Further, tickets are easy to buy. You can order them from any hotel porter, or pick them up at any travel office. When you get to a field, there, likewise, there is no fuss. Your ticket is taken up in a matter of fact way, your baggage weighed for extra charges (10 kg. go free), the bags taken to the plane and you shown to a waiting room or a veranda overlooking the flying field. In due course, announcement is made that your plane is ready. You enter without receiving any warning or cautions. In fact, there are no warnings or cautions to be given, though later, one may read in the timetable that the law requires that one strap himself to the seat during starting and landing. Soon the plane is taxi-ing down the field, it turns into the wind, there is a half-muffled roar and you are in the air.

The Templehof Air Port at Berlin

Questions of safety shortly disappear in the interest in the landscape and in the study of the map handed the passenger at the starting field, while the sight of two pilots, visible through a panel of the door between the passenger and operating compartments, gives one a sense of security. If one needs figures for further assurance, he can recall that the safety is now declared to be on a par with that of railroad or steamship travel. (Last year on the Luft Hansa lines there was one accident resulting in death.)

The flying height varies with conditions, averaging 800 meters, about 2,600 ft., on clear days. If there are heavy clouds, the pilot will stay under them and then, often, fly at a lower level. If they are light and broken he may go above them. In one such experience, the plane rose to a height of 7,800 ft.

Obviously, the appeal for air travel is chiefly the saving in time; though cleanliness, where a long day-ride by train is the alternative, is not a negligible factor. Naturally, the saving is greatest on the long jumps, as from Berlin to Munich, to Vienna, to the industrial region of the Ruhr, to Stockholm, and particularly to Moscow. For example, from Berlin to Munich, 317 miles, takes 11 hours by train and 4½ hours by plane; from Berlin to Moscow, 1,144 miles, is 40 hours by rail and 15 by air; from Berlin to London, 24 hours by train and boat, 9 hours by plane.

In all cases the plane time given is the *scheduled* speed. Because of the possibility of unfavorable weather the speed scheduled is very conservative. It is figured at about 120 km. or about 75 miles an hour. Such low speed may be the actual speed against a head wind, but the planes, depending upon type, fly at 150 or 180 km. an hour. With a following wind they will naturally exceed this speed. In going from Munich to Leipzig, for example, 364 km., the trip was scheduled to take 3 hours. As a matter of fact, the day being calm, the distance was covered in two hours flat, earth to earth, or at a speed of 182 km. (113 miles) per hour. The times above quoted, then, can be figured as being reduced by one-third on a quiet day, and more with a following wind.

Proper comparisons of speed by train and air require allowance to be made for the auto trip to the flying field, which is, in general, longer than the trip from hotel to railroad station.

For long stretches, though, the importance of air service cannot be minimized. Commenting on the international significance, one of the directors of the Deutsche Luft Hansa recently remarked that for a diplomat or business men in Berlin, Rome is now only so far away as Munich had been by train, London as far as Wilhelmshaven, Paris as far as Nuremberg.

All flying is done by day except on the Berlin-Moscow line, on which the departure from Berlin is at 3 a.m. and from Moscow at 4 a.m. Going east a stop is made at Danzig at six and for breakfast at Koenigsberg at 7:20.

(Later stops are made at Kowno and Smolensk.) But the subject of night flying is having very careful study, for it is realized that if this is achieved with safety and satisfaction the traffic can be rapidly increased.

For example, on journeys that can be made in one night by train, the business man is likely to go by rail, so as to have a full day for business at his destination. In using the plane he now loses half a business day. In trying to go by plane from Halle to Duesseldorf, for example, it developed that one would have to leave the business section of Halle at 10:45 a.m. and not reach the business section of Duesseldorf until 3:50. (Flying time from 11:45 a.m. to 3:55 p.m.). So one goes by rail. Of course, if one had a short morning engagement in Halle and afternoon engagement in Duesseldorf, the plane would be an ideal medium.

Naturally, if night flying were general, and one could leave, say, Halle at 5 p.m. or Berlin at 4 and be in Duesseldorf at 10, it is obvious that it would be more attractive to the business man.

Undoubtedly, though, general night flying in passenger service is going to come. The needed instrument equipment for the plane is available and night lighting of routes well developed. It is a matter of cost and demand.

Airplane service in its present state of development is expensive. Depreciation is high, the personnel is high grade and highly paid, technical development requires much money for research and experiment, while the power per passenger ranges from 50 to 70 hp. (as against, say, 6 hp. in average European automobiles). Were all the charges to be paid by passenger fares and by freight and baggage income, the rates would be prohibitive. For that reason the air service of every European country is subsidized. That is the case, too, in Germany. The central government subsidizes the international routes, the states, provinces and cities the inland routes, the total subvention amounting to something over 70 per cent of the total costs. Every plane rider in Europe, therefore, is getting more than he pays for.

By agreement with the governments the air companies charge the same, or approximately the same, as first-class railroad fares. Here are same of the fares in Germany: Berlin-Moscow, 1,144 miles, 300 marks; Berlin-Munich, 317 miles, 105 marks; Berlin-Essen, 282 miles, 85 marks; Berlin-Stockholm, 508 miles, 165 marks; Berlin-London, 615 miles, 190 marks; Berlin-Paris, 570 miles, 180 marks.

Radio and wind direction towers at the Templehof Air Port, Berlin

Incidentally, one asks why the governments here, national and local, are so willing to subsidize aviation. Readiness with personal and factory equipment for warfare is denied. The objective is set forth as commercial: the sale of planes to other countries and the operation of foreign air routes. Both outlets, of course, are most desirable for Germany, because both tend to increase her exports, the one visibly and the other invisibly through the sale of transport service. Further, it is pointed out that the Reich subvention is only 0.30 mark per capita as against national subventions by France and England of 4 to 5 marks. The amount of state, provincial and city subvention in Germany is not available.

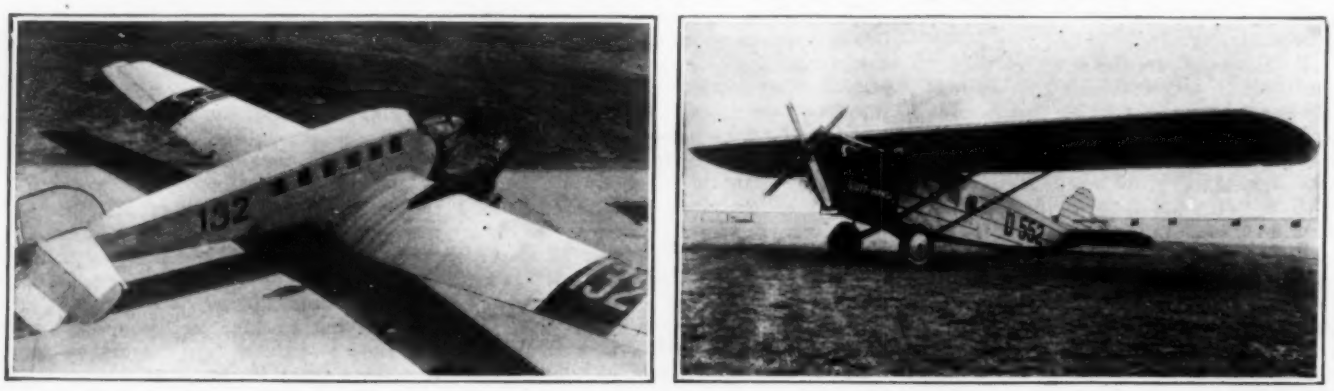
Except for a few older planes on land, flying is done exclusively with all-metal planes of German makes. The four German plane manufacturers, Junkers, Dornier, Rohrbach and Albatross are all represented in the Hansa's equipment. Planes seating four, six or nine passengers are in use, the particular selection for a route depending on the amount of travel. Every plane carries two pilots, and is equipped with radio so that the pilots can report their positions and receive orders and weather reports. Each plane is provided with a small toilet.

Four and six-passenger planes have but one motor, but the nine-passenger planes, huge affairs built by Junkers, have three.

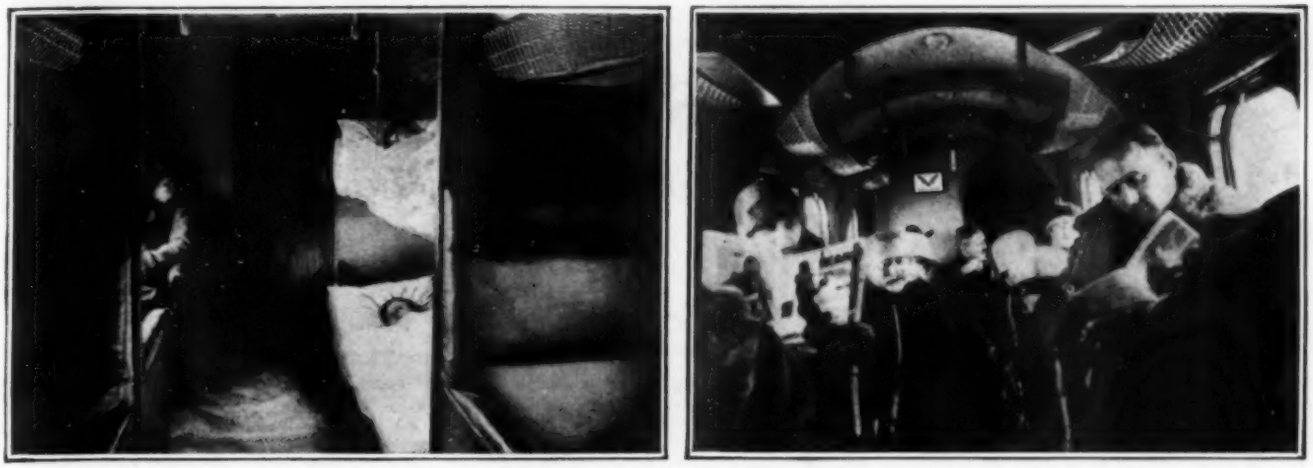
These big Junkers machines, known as G. 24, deserve special mention. "Miss Columbia," Chamberlain's plane, standing alongside one of these all-metal giants on Templehof Field looked like a toy. The G. 24 has a wing spread of 93.5 ft., is driven by three 230-hp. engines, weighs without load 8,360 lb., can carry a useful load of 4,840 lb., and fully loaded has a cruising speed of 155 km. (96 miles) per hour. Besides the nine passengers and a crew of two, the plane can obviously carry a large amount of baggage and freight.

This is the largest plane in regular service in Europe today, but since Prof. Junkers has always had in mind the large development—high-capacity planes for long stretches—a still larger plane is ready for service. Two of the new type, G. 31, have been built and tested, one of them on cruises to Italy and the Balkans, aggregating 7,000 km. These planes will carry 15 passengers, two pilots and a special radio operator if desired. A feature of this plane is the provision of sleeping berths, accommodating 10 people. Here are further details: A wing span of 99.4 ft., a length of 53.1 ft., a loaded weight of 16,900 lb., a speed loaded of 185 km. (115 miles) per hour, and a cruising radius of 620 miles. It is driven by three motors of a total of 1,200 hp.

All commercial aviation in Germany is, for operating purposes, in the hands of the Deutsche Luft Hansa, A. G., a 25,000,000-mark company, formed last year by the consolidation of the Junkers operating company and the Aero Lloyd. Associated companies act as agents for the Hansa, promote traffic and new routes, and handle relationships with state, provincial and city authorities and with business interests.



At the left is pictured a Junkers all-metal, three-motor, nine-passenger plane which is in regular service on the Deutsche Luft Hansa routes. At the right is a Dornier Merkur six- passenger plane



At the left is an interior view of the cabin of the fifteen-passenger plane. At the right is shown the seating arrangement in the Junkers nine-passenger plane

Under this unified operation, it is expected that progress will be even more rapid than in the past. Leaders in German trade, industry, banking, transportation and government departments are represented on the directorate, so that wise and broad council is available. Last year's traffic showed an increase over that of the year before of 50 per cent in passengers, 115 per cent in freight and baggage, and 86 per cent in mail. As the public becomes more "air minded" and as routes are added the rate of increase should be more rapid.

With Germany well served, much thought is being given to additional international routes. Already there is daily service from Berlin to London, Amsterdam, Brussels, Paris, Copenhagen, Stockholm, Memel, Moscow, Prague, Vienna, Zurich and Geneva. A route from Munich to Milan and Rome is to be opened this year, as is one to Madrid and Barcelona. In connection with the latter route a Spanish company proposes to operate a Zeppelin service to South America and the airship for this service is now being built at the Zeppelin works in Lake Constance. Dreams of routes to the Far East undoubtedly will be realized in a few years.

Obviously, all difficulties are not yet solved. Fog today is the chief hindrance to regularity of service, though its interference with schedules last year amounted to only 15 per cent. As far as navigating is concerned, fog is not a hindrance; the clever instruments take care of that. The trouble is in insuring a safe landing. But the problem is being worked on intensively.

The ambition is to develop a service that can go forward under full traffic night and day, summer and winter. This will be aided in Germany by the excellent meterological reports gathered by the network of weather stations. Similar developments in other countries will be needed for extensive air service.

In closing, let it again be repeated that progress here in both traffic and plane design is very rapid. The 9-passenger, 3-motor planes were put in service only in 1925, two years ago. Now the 15-passenger, 10-berth plane is ready. Already thoughts are going farther. I saw in the Junkers factory in Dessau a dream for an ocean air liner, a full sized model with cabins built into huge wings. Six of us sat comfortably in one of the half-dozen cabins of this "dream liner." In this design the wing is enlarged and the cabins built into the wing itself. In other words the plane would be mostly wing; at least there would be no cabin projecting above the wing or slung beneath it. They say at the Junkers works that this design is only an idea, a development for the future, but when one has seen present-day German commercial aviation, sat at a large airport and watched ships arrive and depart at frequent intervals and seen a plane for 15 passengers take the air in 16 seconds and sail gracefully off, one wonders whether the realization is so very far off. The hindrance would not seem to be technical ability but cost; the old problem of engineering—to bring costs within the range of practical economics.

Removal of Trade Barriers Urged by Stockholm Conference

A hopeful view of the possibilities of raising the standards of living throughout the world is given by the American delegation to the fourth congress of the International Chamber of Commerce which has been in session at Stockholm.

Representatives of all the 44 countries meeting at Stockholm unanimously agreed that immediate steps should be taken looking toward every possible increase in the consuming power of two hundred millions of European people, who are still unable to buy food, shelter, clothing and other necessities of life, to say nothing of luxuries, which they enjoyed before the war. One thing necessary to bring this about, they agreed, is a modification of trade barriers, especially between the countries of Europe, as proposed recently by the Trade Barriers Committee of the International Chamber of Commerce, as well as by the Geneva Economic Conference.

Expressions of the delegates were specific on the point that the prosperity of America had proved clearly the advantages of free interchange of goods over large areas in which there were no frontiers or barriers.

The delegates cheered the announcement that already six governments—Germany, Holland, Sweden, Belgium, Austria and Czechoslovakia—had proposed to initiate programs carrying out the recommendations of the Stockholm and Geneva conferences.

Aside from trade barriers the meeting discussed important and generally highly technical committee reports prepared by leading experts of all nations. Among the important approved recommendations are (1) that failure to work a patent be not considered forfeiture, but that owners of non-working patents be compelled to grant licenses to third parties; (2) that each country maintain a register of the owners of patents and only registered ownership shall be valid against third parties; (3) that motor taxes be levied on highway use and the receipts therefrom be employed for highway purposes; (4) that efforts be made to improve international telephony in Europe; and (5) that a conference be called further to unify the practice regarding bills of exchange. The meeting also recommended that efforts be continued to reduce double taxation on nationals residing abroad, the principle being that impersonal taxes should be levied at the source by the country of origin and that personal taxes should be collected by the country of domicile. Other recommendations dealt with shipping documents and details of international commercial arbitration.

Aberto Pirelli, a rubber manufacturer of Milan and a member of the Dawes Committee and of the Italian debt-funding committee to the United States, was elected president of the International Chamber. Amsterdam was selected as the site for the next convention, which is to be held in 1929.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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ONE of the most important financial conferences ever held began in New York last week. The conferees were the Hon. Montagu Norman, governor of the Bank of England, Dr. Hjalmer Schacht, president of the German Reichsbank, Charles Rist, deputy governor of the Bank of France, and Benjamin Strong, governor of the New York Federal Reserve Bank. The subject of the conference has not been announced and its proceedings have been most closely guarded, but it is unlikely that the English economist Sir Josiah Stamp is far wrong in saying that "these four men are, I believe, going to take such concerted action as will prevent the present automatic suction of gold to the United States." He added that Great Britain's trade is held up by the continued fall in the gold price level, which is due to the American policy of continually taking gold off the market and tucking it away, mainly in the Federal Reserve Bank.

If this statement of what is to be expected from the conference proves to be correct, the world will, indeed, have entered upon a new financial epoch. An appreciation of this fact has probably helped to allay the nervousness felt on the Stock Exchange over the continued increase in brokers' loans, for it is clear that international or multi-national control of the world's gold supply would bring us very near to a financial millenium in which a monetary stringency in any country could be prevented by shifting the gold reserves held by the great central bank from where they were superfluous to where they were needed. That some plan under which this would be possible is highly desirable is indicated by a recently published statement which puts the present debt of the world to the United States at $24,000,000,000, including the war loans as adjusted. That this sum or even the interest on it can be paid in gold is obviously impossible, and all thoughtful economists have been concerned about what would happen to the world's trade, and our domestic trade in particular, if Europe attempted to liquidate her current indebtedness to the United States by the shipment of merchandise. Any such attempt would, of course, be met by an increase in our import duties and an impassé might be created from which there would be no escape.

Therefore, it is to be hoped that the quartet of financiers who are now conferring in New York will find some way of meeting a situation whose implications are serious. To the average man in the street who doesn't look very far ahead, the problem may not seem very important, but it is fundamental, nevertheless, and chaos may result unless a solution for it is found well in advance.

WHAT'S DOING IN INDUSTRY

SEASONAL influences are being felt in most of the large industrial centers throughout the country. Buying of machinery and shop equipment is scattered and shows a tendency on the part of users to take on only such tools as are needed for immediate use in production, or for replacing obsolete machines. July has started off poorly and little improvement is looked for in the coming two weeks.

CINCINNATI reports a fair volume of business, the market showing a slow recovery. Some orders for special machinery have helped an otherwise slow week in Indianapolis. A slight improvement is noted in Detroit and some attractive inquiries have brightened the outlook. Chicago reports increased sales activity.

THE SOUTH on the whole is quiet, but certain classes of textile and construction machinery are enjoying a good season. The national railways and the automotive industry are furnishing action for machinery dealers in Canada. The New England territory reports a slight falling off in orders in the past ten days but the general volume is satisfactory.

THE GENERAL business outlook for the next month or two—and until after the crops have been harvested—may be described as one of subdued satisfaction, with conditions that could be worse, although they are not quite as good as it was hoped they would be earlier in the year.

Business conditions in the United States are well summarized by the Federal Reserve Board, which says that the distribution of commodities during the month of June was in smaller volume than last year. The Boston bank reports a continuance of the recession. The Cleveland bank says that, on the whole, business is still good, although not quite up to last year's level. The St. Louis bank says that in the face of continued unfavorable weather, and flood conditions, trade and industry showed a well defined improvement during June. The Kansas City bank notes a lack of uniformity in seasonal trends, and alludes to the adverse effect of cool weather. The Minneapolis bank comments upon the smaller volume of business in the Northwest, and the Richmond bank admits that, on the whole, the general outlook seems to be somewhat less favorable than at the same time last year.

Trade reports say that the steel industry has settled itself down to summer dullness and that the mills are working at about 70 per cent of their full capacity. The Southern cotton mills are all busy, and conditions in New England are improving, but the demand for cotton goods is a little less active than it was. The cotton market has been waiting quietly for the government report on acreage. Silk has been surprisingly steady when the depression in Japan is considered, and raw wool is higher in both London and Boston.

The automobile production is about 15 per cent under 1926. The decrease is attributed to Ford's under-production. A good many automobile dealers are advertising sales at sacrifice prices. The building in New York City shows a decrease of 28 per cent for the first five months of the year, but the F. W. Dodge Co. reports that June construction in the territory east of the Rocky Mountains was the largest on record.

The foreign situation has developed a good many interesting phases, but none of them have a direct bearing upon American business. The outlook for the next month or two and until after the crops are harvested may be described as one of subdued satisfaction, with conditions that could be worse, although they are not quite as good as it was hoped they would be.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CINCINNATI

Machine tool manufacturers in the Cincinnati district report a fair volume of business in the past week, standing that the market is recovering in a normal way from the lull that followed the holiday of the previous week. Likewise, selling agents report that the local market is improving from day to day.

Manufacturers state that inquiries are coming in freely from all sections of the country the major portion of these being in regard to single tools and replacements. The principal inquiries are general machinists and small users in various industries, who seek information about various sizes and types of tools.

No large lists are reported, but several small ones came in. The opinion is that for the time being at least the market feature will continue to be scattered purchases of single tools and replacements.

Production continues at a normal level for the season and manufacturers report that business on hand and in sight will keep the plants fairly busy.

INDIANAPOLIS

Little improvement is to be seen in the machinery and machine tool business here. Dealers say the market is becoming spotty and they see no chance for any improvement until fall. Some orders are being received, but as a general rule, they are for small amounts and there is considerable shopping about before purchasing.

One of the disappointments of the season has been in the railroad business. The season started out good as the roads began their annual repair programs, but during the past month orders have fallen off. With the interurban companies and other public utilities, however, there has been a fair business, most dealers saying that the volume during the first six months of the year was about equal to the same period of last year. Taking the market entire for the first six months of this year, there has been a very slight increase over business for the same period in 1926.

DETROIT

Conditions in Detroit have shown a slight improvement since the Fourth of July, but there is still very little tangible basis for optimism. However, dealers in machinery and machine tools have become a little more optimistic than they were a week or two ago. Inquiries are beginning to come in, a few orders have been placed and the general tone seems to be promising. In the field of specialized equipment there has been little basis for complaint. Many large orders have been received for highly specialized machines, many of them large ones, and the business level has been good. But the general machinery market has been very poor for many weeks and until this week there seemed little likelihood that it would soon improve.

But there is still a universal tendency to mark time which is undoubtedly due to the suspense occasioned by the Ford Motor Co. The Dodge plant is showing some activity. The new six is going well and plans are being made for new models. Paige is doing some buying in preparation for extensions.

It is felt here that the fall and winter will be busier than any recent year. The plans of the Yellow Truck and Coach Co. in Pontiac are just one of many reasons for this. The expenditure of several millions in Pontiac by the General Motors will do much to raise the level of the year, but there are other contemplated programs that will probably be translated into action before the year is out.

CHICAGO

A slight, though distinct improvement in the status of the machine tool market is reported by dealers generally during the first week of July. This applies to both new and used tools. A number of sales, a few of which were of major importance, have brightened the market situation somewhat, and given rise to a feeling that this month may produce a volume of business that was not anticipated in view of the poor showing made during the last three months.

Railroad buying, with respect to old lists, is practically wound up, but some new inquiries for small lots needed in shops by the Rock Island, the Northern Pacific and the Burlington roads are reported. Such demand as has materialized thus far this month comes mainly from general industry in Chicago and the Middle-West.

There has been quite a little buying recently of used tools on the part of some dealers who have spare funds that may be employed for that purpose, and who have been taking advantage of low prices of equipment at forced sales. Generally speaking, there is a more encouraging outlook among machinery men than for the last few weeks.

NEW YORK

Business in this market is slow in starting. The last week or so in June gave some promise of a better tone in sales activities, but July has not brought much response to the stimulus offered. Scattered buying by a variety of machinery users has kept the volume of orders at a fairly satisfactory level, although the present crop of inquiries does not indicate any advance.

Orders from large industrials have been conspicuous by their absence of late, and what little buying has been done by this group has been confined to single machines for experimental or replacement purposes. Small manufacturers of all kinds of metal products have been the mainstay of the market. Railroads have been moderately active, the Louisville & Nashville, the Chicago, Rock Island & Pacific and the New York Central were included in the list of buyers last week. Standard tools are not in demand at present. Special production machinery is being placed in plants where its usefulness can be proved by the cutting of time and of labor costs.

SOUTHERN DISTRICT

Though machinery and machine tool distributors in this district report business as a whole quiet, some lines have been showing improvement in the last two weeks. Principally, this includes woodworking machinery for furniture plants, road-building equipment and textile machinery, all of which have shown gains over the corresponding period of a year ago.

Sales in the textile field are mainly to new plants being erected in the Southeast, and in addition to showing steady improvement recently the outlook is very good for the summer period. Road-building sales are the most active in the Georgia, east Tennessee and Carolina territory where a more than ordinary amount of new road construction and maintenance work is now in progress.

There is little demand reported from the automotive field or from smaller machine shops, both these buyers showing much less activity than last season. Construction machinery sales also continue inactive due to lack of new work. Demand from the railroads has failed to show the expected improvement, though a few fairly good sales of heavier equipment have been made for some of the new shop construction projects. The inquiry is better, however, and the outlook more promising than it has been in some time.

NEW ENGLAND

A survey made among machine builders in the New England territory leads to the conclusion that while there has been a slight falling off in business during the past few weeks, the volume, generally speaking, is such that with the half year past the total betters the records for the corresponding period a year ago. Anticipating the future, practically all were of the opinion that the outlook is favorable and the year's record will equal 1926.

In Hartford County, state of Connecticut, the bulk of manufacturing is related to the machinery trade. On June 1, the man-hour operations was 84 per cent normal, an increase of 4 per cent over January. The average man-hour operations for the state was 79.8 per cent. In Bridgeport the operations were 72.2 per cent. In Springfield, Mass., the operations have been as favorable as a year ago and in Worcester, Mass., reports of better conditions were received.

Business placed during the past week was below normal. Production was decreased by the closing of plants.

CANADA

While the usual seasonal decline is apparent, the metal working industry of Canada has entered the third quarter of 1927 with business on its books sufficient to keep it fairly busy until the end of August.

Machine tool manufacturers report the receipt of a fair volume of business from the railways and the automotive industry, and also an improvement in the demand for mining equipment. An extensive program of new work and betterments is now under way throughout the Canadian National Railway system, this work affecting all parts of the line from the Atlantic to the Pacific and including new rail, buildings, bridge work and signalling.

Business in the metal markets throughout the industrial area of western Ontario, which includes Toronto and Hamilton, seems to be settling down to its usual summer routine, and by the way spot and future business is appearing the record for July and August will be as good as last year. Reports from Montreal indicate that industries in that district have been reasonably active during the last couple of weeks, but as yet there is little manifestation of what the third quarter will bring.

Production of automobiles in Canada during May totalled 25,708 cars having a sales value of $17,411,660. This was the greatest monthly output in the history of the industry.

Purchasing Agents Act to Counteract Padded Sales

"In order to counteract the efforts of certain foreign houses to defraud American business firms, the National Association of Purchasing Agents has launched a campaign to acquaint the American public with these nefarious activities. It is estimated that "gyp" sales are now being made at the rate of six million dollars per year." This is the gist of a statement just issued from the headquarters of the National Association of Purchasing Agents, at New York.

"Sixty American concerns will soon discover they have been victimized to the extent of probably fifty thousand dollars by a clever Swiss salesman," says the statement. "Sixty separate shipments are now en route to New York, on one ship, from one company in Europe, consigned through one forwarding agent to the sixty concerns in this country." Experiences of American customers of this and other European concerns have been reported to W. L. Chandler, secretary of the association, who says the chances are that all these shipments are the result of misrepresentation on the part of slick salesmen.

The methods employed by these salesmen are much the same, he states. They usually are based on trial orders. The salesmen generally avoid the authorized purchasing agents. They frequently present letters of introduction from bankers to corporation presidents or general managers. They profess to have a superior line of tool steel, industrial packing, shop files, or other material usually purchased upon recommendation of shop foremen or superintendents.

The National Association of Purchasing Agents reports one case in which a corporation president became so impressed with the quality of the material offered to him for trial that he personally signed an order blank provided by the salesman for a trial order of files and tool steel. Later, when the shipment arrived, it became evident that he had unconsciously signed an order so worded that his company was legally bound to a purchase amounting to six thousand dollars. Instead of being enough for a trial order, as represented by the salesman, the amount of material delivered would require many years to consume.

The files of the association are said to contain scores of cases in which foremen, superintendents, works and production managers, and store keepers have been victimized by "gyp" salesmen of domestic and foreign concerns selling trial orders of foreign merchandise.

One salesman for an American packing manufacturer reported all his territory so filled up through these padded orders that he could not hope to sell another pound of packing for ten years. He, therefor, had to seek another job.

Mr. Chandler says that the association may decide to call a meeting of the victimized concerns for the purpose of banding them together for mutual protection. Individually they are helpless because their contracts are legally binding. Collectively they have a chance of exposing the practices of these selling concerns. A similar situation recently developed in Canada and the Canadian affiliated branches of the National Association of Purchasing Agents organized the victims and secured cancellation of all contracts.

Machinery Exports Show Upward Trend

Machinery exports from the United States continue on an upward trend, according to figures released by the industrial machinery division of the Bureau of Foreign and Domestic Commerce in a summary of machinery exports to various foreign countries during the year 1926. The greatest gain in exports last year, however, was to Canada, while exports to Great Britain, Germany, France and Italy declined from the total of the previous year.

The machinery trade with Russia is particularly noteworthy, the exports to that country having expanded from $64,000 in 1922 to $4,100,000 in 1926, to which should be added shipments to Asiatic Russia of $522,000 in 1926. Another peculiarity in the situation is shown in the decreased machinery exports to such important South American countries as Brazil and Argentina, and the large increases to countries of the North and West coasts including Venezuela, Colombia, Peru and Chile. This possibly can be explained by increased European purchases by the East coast countries, and greater American sales to the expanding petroleum industry of Venezuela and Colombia, and the greater activity in the copper and nitrate industries of the West coast. The exports of machinery to Venezuela increased from $3,920,000 in 1925 to $7,784,000 in 1926; and those to Chile increased from $4,230,000 in 1925 to $7,558,000 in 1926. Increased machinery exports are also noted to many of the countries of the Far East. including Japan, the East Indies, China, Australia and New Zealand.

Cincinnati Accountants Elect T. B. Frank

Thomas B. Frank, treasurer of the Cincinnati Planer Co., of Cincinnati was elected president of the Cincinnati Chapter of the National Association of Cost Accountants at the annual meeting of that body held recently. Mr. Frank has been active in accounting circles for a number of years. J. Thomas Otto, assistant comptroller of the Cincinnati Milling Machine Co., was elected a director, and Herbert W. Boal, comptroller of the Andrews Steel Co., was also elected a director. Edgar Swick, office manager of the Laidlaw Works of the Worthington Pump and Machinery Co., was re-elected to the vice-presidency of the chapter.

Leipzig Trade Fair Open in August

The international trade fair, which has been held for centuries at Leipzig, will be open this year from Aug. 28 to Sept. 3. It is expected that more than twenty countries will display their newest products, and buyers will be attracted from over forty countries. America is taking great interest in the fair this year, since it presents a unique opportunity to enter world markets both as exhibitor and buyer.

Germany has recently sent hundreds of its leading scientists and business men to the United States to study methods of manufacture and market conditions, and is making a special effort to develop business relations with America. A great variety of industrial products have been prepared in Germany to appeal to American demands.

The Leipzig Fair is held twice annually for periods of a single week. Thousands of exhibits from all parts of the world are so arranged that buyers can see in a few hours what otherwise would require months of travel to widely scattered markets.

Although the Leipzig fair is much larger than most of the world expositions it is distinctly an industrial exchange, organized for the convenience of business men. It has no amusement features. Visitors are admitted to the exhibition grounds and the buildings only by invitation. For information concerning the fair address the Leipzig Trade Fair, Inc., 630 Fifth Ave., New York City.

Asks Co-operation on Tax Reform

An appeal to business organizations in the United States to co-operate with the Congressional Joint Tax Committee in the involved task of overhauling and perfecting the federal tax system was made last week by the Chamber of Commerce of the United States in a communication sent to its 1,500 member organizations. Business, the chamber asserts, has a direct interest in the systematic revision of the federal revenue system.

The chamber is careful to point out that the work of the joint committee has nothing to do with immediate tax reduction, nor primarily with rates, but that it will deal rather with questions of administration and simplification, such as interest provisions, statutory time limits, installment sales, capital gains and losses, earned income credit. It points out that the program of immediate tax reduction will be taken up by the Ways and Means Committee and reiterates its demands for a reduction of the corporation tax to not more than 10 per cent, repeal of the federal estate tax and elimination of the remaining war excise taxes.

Regarding the corporation income tax the chamber asserts that the reduction of this should not be made contingent upon the available surplus.

Personals

HERMAN C. SCHUTTE has been appointed assistant trade commissioner for the Department of Commerce at Paris.

KENNETH H. HILL, of New London, Conn., has been appointed assistant trade commissioner at Berne, Switzerland.

D. H. F. MOORE, professor of engineering materials at the University of Illinois, has been elected president of the American Society for Testing Materials.

FRANK B. CALDWELL has been appointed sales manager of the Link-Belt Co., of Chicago. He will supervise sales activities in the Western division.

GEORGE MEAD BOND, of Hartford, Conn., has been awarded the degree of Master of Science by Trinity College, for his work in the perfection of precision instruments.

STRICKLAND J. KNEASS has been awarded the John Scott Bronze Medal by the A.S.M.E. Mr. Kneass is manager of the injector department of the Wm. Sellers & Co., of Philadelphia.

ARTHUR WALSER has been appointed South American representative for the Dodge Manufacturing Corporation, of Mishawaka, Ind., manufacturer of conveying and transmission machinery.

G. W. CRAIGHEAD has been appointed district representative in eastern Michigan for the Foote Bros. Gear and Machine Co., of Chicago. He will have headquarters in the General Motors Bldg., Detroit.

A. H. TISCHER, formerly of the engineering development department of the Foote Bros. Gear and Machine Co., of Chicago, has been transferred to the sales organization of the company and will cover part of Chicago and northern Indiana.

L. E. RUTHENBURG, general manager of the Yellow Sleeve Valve Engineering Works, East Moline, Ill., has been appointed assistant to the president and placed in charge of the company's new plant at Pontiac, Mich.

WILLIAM S. KRIEBEL, JR., has been appointed salesman in the Philadelphia territory for the Bridgeport Brass Co., of Bridgeport, Conn. He will have headquarters in the Bankers Trust Bldg., Philadelphia.

CLARENCE M. YOUNG, of Des Moines, Iowa, has been appointed director of the aeronautics branch of the Department of Commerce. In this capacity Mr. Young will supervise the work of the entire branch and will act as first assistant to Secretary MacCracken.

M. T. GOSSETT, an engineer identified for some years with the United Iron Works, Inc., Memphis, Tenn., has been appointed manager of a new department for the manufacture of refrigerating equipment recently established by the Nashville Machine and Supply Co., of Nashville, Tenn.

HENRY S. DAY, manager of the transportation division of the Westinghouse Electric and Manufacturing Co., has been selected by the United Electric Railways of Providence, as superintendent of equipment. For the past five years he has had charge of all Westinghouse transportation activities in New England.

ELMER A. SPERRY, president of the Sperry Gyroscope Co., of Brooklyn, N. Y., has been appointed a member of the executive committee of the aeronautical division of the A.S.M.E. He takes the place of George J. Mead, vice-presidnt of the Pratt & Whitney Co., who resigned.

WALDO C. BRYANT, president and treasurer of the Bryant Electric Co., Bridgeport, Conn., has resigned and will continue with the company as a stockholder and chairman of the board of directors. Walter Cary, first vice-president of the Westinghouse Lamp Co. will succeed Mr. Bryant as president.

PAUL D. CRAVATH, general counsel for the Westinghouse Electric & Manufacturing Co., was elected temporary chairman of the board at a recent meeting. Mr. Cravath will assume the duties of the late Guy E. Tripp until a permanent chairman is selected. W. L. Mellon, of Pittsburgh was added to the board's membership.

GEORGE L. ROGERS, manager of the file works of Henry Disston & Sons, in Philadelphia, celebrated his fiftieth anniversary of employment with the company on June 28. An informal reception by the executives and employees of the company was held, at which a gold watch was presented to Mr. Rogers.

BURTON L. DELACK, assistant manager of the Schenectady works of the General Electric Co., has been appointed acting manager. Mr. Delack fills the vacancy caused by the promotion of C. E. Eveleth, elected a vice-president this year. EDWARD A. WAGNER, formerly of the Fort Wayne Works, has been made acting manager of the Pittsfield Works, succeeding Mr. Chesney, who has been a vice-president in charge of manufacturing since the retirement of F. C. Pratt. GIUSEPPE FACCIOLI, works engineer of the Pittsfield works, has been appointed associate manager and works engineer of the Pittsfield Works.

Business Items

The Briggs-Shaffner Co., of Winston-Salem, N. C., has been appointed distributor in North Carolina for the Foote Bros. Gear and Machine Co., of Chicago.

The Detroit Piston Pin Manufacturing Co. of Detroit, announces that it will remove to Grand Haven, Mich., where a new factory is in process of construction.

The Quick Set Wrench Co. has been organized at Birmingham, Ala., for the manufacture of a new type of wrench. H. M. Graham, Howard Graham and L. L. Pettitt, all of that city, are the incorporators named.

The Ingersoll-Rand Co., of New York, announces the opening of a branch office at 236 High St., Newark, N. J. F. K. Armstrong, formerly connected with the company's home office, has been appointed manager of this branch.

The Petroleum Electric Co., of Tulsa, Okla., has been appointed sales representative in the state of Oklahoma for the Roller-Smith Co., of New York, manufacturer of electric instruments and circuit breakers.

The Kent Machine Co. has moved its factory and offices from Kent, Ohio, to Cuyahoga Falls, Ohio, where they have been combined with the Falls Clutch and Machinery Co., recently purchased by the Kent company.

W. Asquith, Ltd., Halifax, a member of the Associated British Machine Tool Makers, Ltd., has retired from that sales organization and hereafter will conduct its own sales both at home and abroad. Inquiries should be directed to the home office at Halifax.

The Whitney Metal Tool Co., of Rockford, Ill., has purchased the building formerly owned and occupied by the Wait-Talcott Co., which adjoins the Whitney property. The added facilities will enable the company to increase its production of punches and shears.

The Modern Tool Co. announces the removal of its plant from Erie, Pa., to Rochester, N. Y. This company, which is a unit of the Consolidated Machine Tool Corporation of America, manufactures a line of tool grinders, threading machinery and dies. Arrangements have been made to move many of the employees from Erie to Rochester.

The W. A. Ragsdale Rotary Engine Co., a Mississippi concern recently organized, will establish a plant at New Orleans for the manufacture of steam engines, it is announced by W. A. Ragsdale, of Grenada, Miss., one of the incorporators. A. C. Anderson, 3622 Canal St., New Orleans, is the president of the new company.

The Columbia Nut and Bolt Co., Bridgeport, Conn., will move its manufacturing business to the plant of the Atlantic Manufacturing Co., at Milford, Conn. President Fred Atwater has announced that manufacturing will start in the plant of the Atlantic company about Sept. 1. Executive and sales offices will be maintained in Bridgeport.

The Bethel-Player Co., Inc., has been organized and incorporated at Westboro, Mass., taking over the assets of the old Bethel-Player Co. Sydney Player is president and general manager of the new organization; Joseph N. Bethel is vice-president and sales manager. The company will continue the manufacture of measuring instruments, lapping machines and special machinery.

Negotiations have been concluded for the consolidation of the Wilmarth & Morman Co., of Grand Rapids, Mich., with the Machinery Co. of America. The merger also takes in the Covel Manufacturing Co., of Benton Harbor, the Tuthill & Bolton Co., of Grand Rapids, and the Hanchett Swage Works, of Big Rapids. The Machinery Co. of America will act as a distributing agency. No change in factory management or personnel is contemplated.

The Taylor-Winfield Corporation has been organized at Warren, Ohio, being a merger of the Taylor Welder Co., the Winfield Electric Welding Machine Co., and the Winfield Manufacturing Co., all of Warren, Ohio. Officers of the new company are: Albertis C. Taylor, president and general manager; G. P. Gillmer, vice-president; and J. H. Ewalt, treasurer. N. H. Cobb is secretary. Work is under way for the construction of an addition to the present plants. Branch offices are located in New York, Philadelphia, Chicago, Detroit, Cleveland, St. Louis, Los Angeles and in Toronto, Canada.

Obituaries

P. A. PETERSON, president of the Rockford Drop Forge Co., of Rockford, Ill., died in that city on June 27.

EDWIN L. FORD, retired steel manufacturer and one of the founders of the Youngstown Steel Co., died at Youngstown, Ohio, on July 5 . He was 71 years old.

JOHN C. POLAND, well-known inventor of laundry machinery, died recently at his home in West Roxbury, Mass. Mr. Roland was 80 years old.

CHARLES ANTHONY MORSS, vice-president of the Simplex Wire and Cable Co., Boston, Mass., died July 5, at his home in Brookline following an illness of several months. Mr. Morss was 70 years of age.

DR. SIGMUND BERGMANN, president of the Bergmann Electric Works, one of the leading German industrial organizations, died in Berlin on July 7. Mr. Bergmann was a partner of Thomas A. Edison in the development of the electric light.

Forthcoming Meetings

Steel and Power Show. First Steel and Power Show in the Varsity Arena, Toronto, Canada, sponsored by the Montreal and Toronto Chapters of the American Society for Steel Treating; by the Canada, Toronto and Hamilton Councils of the Universal Craftsmen's Council of Engineers; by the Engineers' Mutual Benefit Fund; the American Electroplaters' Society; and the Canadian section of the American Welding Society. Aug. 31 to Sept. 2. General chairman, C. Bradshaw, 153 University Ave., Toronto, Canada.

Machine Tool Exhibit. Seventh annual machine tool exhibition under the auspices of the New Haven Section of the American Society of Mechanical Engineers, the Department of Mechanical Engineering of Sheffield Scientific School, Yale University, and the Chamber of Commerce of New Haven: At the Mason Laboratory, Yale University, Sept. 6 to 9. Harry R. Westcott, chairman of the exhibit committee, 400 Temple St., New Haven, Conn.

Machine Tool Builders' Exposition. First annual machine tool exposition, conducted by the National Machine Tool Builders' Association, at the West Annex of the Public Auditorium, Cleveland, Ohio, Sept. 19 to 24. J. Wallace Carrel, vice-president and general manager, the Lodge & Shipley Machine Tool Co., Cincinnati, chairman of the exposition committee. Roberts Everett, manager of the exposition, Pennsylvania Bldg., New York. Ernest F. DuBrul, general manager of the association, 826 Provident Bank Building, Cincinnati, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

FAIRLY active demand prevails for steel bars; buying in most of the other items listed appears to be gradually slowing down. Iron and steel prices hold steadily to quoted levels despite drop in both production and demand. All buying is in moderate quantities. Materials most affected by this week's declines are: non-ferrous metals, solder, highest grade babbitt, scrap brass and lead. Linseed oil is off 1c. per 7½-lb. gal. at Chicago. Steel plates and shapes, base, Pittsburgh mill, range from $1.75 to $1.85 per 100 lb. in several carlot quantities; bars are $1.80@$1.90 per 100 lb., f.o.b. mill.

(All prices as of July 8)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$22.19
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	26.37
BIRMINGHAM	
No. 2 Foundry	18.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	22.76
Virginia No. 2	27.17
Basic	21.76
CHICAGO	
No. 2 Foundry local	21.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	23.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.76
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	4.75@5.25

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.25	3.50	3.25	3.89
No. 12	2.30	3.55	3.30	3.94
No. 14	2.35	3.60	3.35	3.99
No. 16	2.45	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.80	3.75	3.75	4.00
No. 22	2.95	3.90	3.90	4.15
No. 24	3.00	3.95	3.95	4.20
No. 26	3.10	4.05	4.05	4.30
No. 28	3.25	4.20	4.20	4.45
Galvanized				
No. 10	3.15	4.10	3.95	4.25
Nos. 12 to 14	3.25	4.20	4.05	4.35
No. 16	3.35	4.30	4.15	4.45
No. 18	3.50	4.45	4.30	4.60
No. 20	3.65	4.60	4.45	4.75
No. 22	3.70	4.65	4.50	4.80
No. 24	3.85	4.80	4.65	4.95
No. 26	4.05	5.05	4.90	5.20
No. 28	4.30	5.30	5.15	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded.	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft. or 100 lb.:

Thickness — Decimal	B.w.g. and Fractions	Outside Diameter in Inches ¼	⅜	½	⅝	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	29
.095"	13	.21	.23	.25	.26	.27	.29	31
.109"	12	.22	.24	.26	.27	.28	.30	32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.10	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (2.75 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ½, 7.35c. per lb. *Flat, 1/16@¼-in. thick.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic, up to carlots, New York			13.75
Tin, pigs, 5-ton lots, New York			66.37½
Lead, pigs, up to carlots, E. St. Louis	6.05	New York	6.87½
Zinc, slabs, up to carlots, E. St. Louis	6.15	New York	7.00

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	15.00	17.50	13.00
Copper sheets, base	21.25	21.25	21.25
Copper wire, base	18.00	18.00	18.00
Copper bars, base	20.75	21.00	20.75
Copper tubing, base	23.25	23.25	23.25
Brass sheets, high, base	17.50	17.50	17.50
Brass tubing, high, base	22.37½	22.37½	22.37½
Brass rods, high, base	15.25	15.25	15.25
Brass wire, high, base	18.00	18.00	18.00

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	26.00	26@27	26.02
Zinc sheets (casks)	11.00	11.30	10.11
Solder (½ and ½), (case lots)	40.00	42.00	38½@42½
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade			84.00
Commercial genuine, intermediate grade			61.00
Anti-friction metal, general service			31.50
No. 4 babbitt (f.o.b.)			13.00
Nickel, f.o.b. refinery, cents per lb.:			
Ingots 35.00	Electrolytic 39.00	Shot	36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11.00 @11.25	10.50	9.75@10.25
Copper, heavy, and wire	10.25 @10 75	10.50	9.00@ 9.50
Copper, light, and bottoms	9 00 @ 9 50	9.00	8.00@ 8 50
Heavy lead	5 25 @ 5 50	5.25	4.50@ 4 75
Tea lead	4.50 @ 4.75	3.25	3 00@ 3 50
Brass, heavy, yellow	7 00 @ 7.25	6.75	6.25@ 6 75
Brass, heavy, red	8.75 @ 9.00	9.25	8.50@ 9.00
Brass, light	5.00 @ 5.50	6.00	5.50@ 6 00
No. 1 yellow rod turnings	7.25 @ 7 50	7.00	6.50@ 7 00
Zinc	3.75 @ 4.00	3.00	2.50@ 3.00

TIN PLATES—Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	12	.12@.17
Wiping cloths, washed white, per lb	.15½	36 00 per M	.15
Sal soda, per lb	.02½	02	.02¾
Roll sulphur, per lb	.02¾	03½	04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	.87	99	86
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.65	50	.50
Machine oil, medium-bodied (55 gal. metal bbl.), per gal.	.33	.35	.29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	40–5%	40–5%	40–5%
Heavy grade	30–10%	30–10%	30–10%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.04
Brass rods	per lb.	.1525	.155	.1662½
Solder (½ and ½)	per lb.	.41	.4075	.3912½
Cotton waste, white	per lb.	.10@13½	.10@.13½	.13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.55
Lard cutting oil	per gal.	.65	.55	.55
Machine oil	per gal.	33	33	.35
Belting, leather, medium	off list	40–5%	40–5%	40–5%
Machine bolts, up to 1x30 in, full kegs	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
*Flint paper	$5.13	$4.95	$5.13
*Emery paper	10.71	9.15	10.71
*Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.29	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag		.75	.75
Coke, prompt furnace, per net ton		Connellsville,	3.00@3.25
Coke, prompt foundry, per net ton		Connellsville,	4.25@4.75
White lead, dry or in oil,	100 lb. kegs		New York, 13.75
Red lead, dry,	100 lb. kegs		New York, 13.75
Red lead, in oil,	100 lb. kegs		New York, 15.25

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Broken Kegs or Cases	Full Kegs or Cases
Machine bolts, square heads and nuts:		
Up to ¾ x 6-in	50%	50–10%
Larger up to 1 x 30-in	45%	50%
1¼ and 1¼ in. dia	30%	35%
Carriage bolts:		
Up to ½ x 6-in	50–10%	.....
Larger sizes	50%	.....
Coach and lag screws:		
Up to ½ x 6-in	50–10%	.....
Larger sizes	50%	.....
Tap bolts, hexagonal heads	45%	.....
Nuts:		
Hot pressed, square and hexagonal, blank or tapped	45%	50–10%
Cold punched, square and hexagonal, blank or tapped	45%	50–10%
Semi-finished, hexagonal, tapped, in packages	40%	.....
Case hardened, hexagonal, tapped, in packages	30%	.....
Washers: Deduct from list, per 100 lb.	$1.50	$3.50
Rivets, button and cone head:		
Small, including ⅜-in. dia	.....	50–10%
Large (base) per 100 lb	$6.50	$5.00

EXTRA per 100 lb. on rivets, for ½-in. dia., 35c.; ⅝-in., 15c.; 1-in., 5c.; length 1-in. and shorter, 25c.; longer than 1-in. up to and including 1½-in., 15c.; longer than 5-in., 25c.; standard countersunk head, 25c.

Machine Requirements and Industrial Construction

Equipment Wanted

Ill., Chicago—W. I. Denny, 622 West Lake St.—heavy duty horizontal punch and lathes.

Ill., Danville — I. S. Mahr, Danville—forging machinery and various tools.

Mass., Brighton (br. Boston)—S. S. Deans, 50 Congress St., Boston—miscellaneous tools and equipment for repair, sales and service station, at 290 North Beacon St., here.

Mass., Cambridge (br. Boston)—P. O. Box 22, Cambridge—squaring shears for cutting iron up to 20 gage and 7 ft. long; machine for threading and cutting 3 to 6 in. pipe (power driven).

Mass., South Boston (br. Boston)—School House Dept., City Hall, Boston—metal working machinery for South Boston High School, Thomas Park and G Sts., here.

Mich., Pontiac—Yellow Truck and Coach Co., General Motors Bldg., Detroit,—equipment for manufacture of coaches for proposed 3 story 110 x 340 ft. assembly plant, 1 story, 1860 x 600 x 360 ft. body plant and 100 x 100 ft. power plant, here. Estimated cost $8,000,000. Noted June 23.

N. Y., New York—Bd. Water Supply, Municipal Bldg., G. J. Gillespie, Pres., takes bids until July 26, machine tools and equipment for maintenance and operation of Schoharie reservoir and Shandake tunnel.

N. Y., Rochester — I. S. Snyder, 1001 Monroe Ave.—lathes, tools, drills, etc.

O., Chillicothe—Dept. Highways & Pub. Wks., Hartman Bldg., Columbus, W. A. C. Hineman, Purch. Agt.—3 lathes, 12 x 24 in.; 2 cylinder grinders, no 5 Landis; 2 or 3 burning in machines; 2 or 3 pedestal grinders, drill presses, tire presses, etc. for new garage.

O., Dayton—Reliable Foundry Co., 1 Mt. Hartman St., W. H. Placke, Genl. Mgr.—complete equipment for foundry.

O., Jackson—Wick Bros.,—electric drill, heavy press for pulling, reamer and other equipment for proposed garage, here. Estimated cost $40,000.

Pa., Phila.—J. Hyman & Sons, Tioga and Almond Sts. L. Hyman, Purch. Agt.—drilling and forging machinery.

Pa., Phila.—R. E. German, 413 North 3rd St.—drilling and forging equipment, also pneumatic tanks.

Tex., Edinburg—L. F. Terry, Webster,—drill press, lathe, etc. for proposed repair garage, here. Estimated cost $40,000.

Que., Montreal—Aug Jean, 1250 St. Timothee St., Montreal,—complete equipment for service station, auto repair shop and garage.

Opportunities for Future Business

Conn., Bridgeport—Columbia Phonograph Co., Inc., Railroad Ave. awarded contract for the construction of 1 story factory addition. Estimated cost $45,000. Private plans.

Conn., Hartford—White Motor Co., H. R. Hadlow, Contr. Engr., 842 East 79th St., Cleveland, O., takes bids until July 15, for construction of 1 story sales and service building, here. Estimated cost $150,000. Private plans.

O., Galion—Galion Metallic Grave Vault Co., awarded contract for the construction of 1 story, 150 x 600 ft., factory. Estimated cost $100,000.

Ind., Elkhart — Curtain Supply Co., awarded contract for the construction of 1 story 200 x 350 ft., foundry and machine shop. Estimated cost $200,000.

Ind., Kokomo—Continental Steel Co., Canton, O., having plans prepared for the construction of sheet bar mill, here. Estimated cost $750,000.

Ill., Moline — Williams-White Co., H. Ainsworth, Pres. 3rd Ave. and 8th St. soon takes bids for the construction of 150x300 ft. foundry addition, here. Estimated cost $85,000.

Ia., Marshalltown — Cooper Mfg. Co. awarded contract for the construction of 1 story, 34x190 ft. addition to factory for manufacture of auto parts. Estimated cost $50,000.

Ia., Sioux City—Sioux Gas & Electric Co., W. J. Bertke, Vice Pres. and Genl. Mgr. Commerce Bldg. having plans prepared for the construction 2 story, 150x220 ft. service and garage building at 1st Ave. and Court St. Estimated cost $300,000.

Ia., Waterloo—John Deere Tractor Co., 1312 13th St., East Moline, Ill. awarded contract for the construction of 1 story, 120x300 ft., factory at Miles St. and Commercial Ave., here. Estimated cost $60,000.

Mass., Boston — Meisel Press Mfg. Co., Dorchester Ave., taking bids for the construction of 1 and 2 story, 100 x 225 ft., manufacturing plant, at Dorchester and Crescent Aves. Estimated cost $40,000. H. S. Clerverdon, 46 Cornhill, Boston, Archt.

Mass., Brockton — Peter Wychunas, 50 Ames St., Montello, taking bids for the construction 1 story garage and welding shop on Montello and Ames Sts., here. Estimated cost $40,000.

Mass., Chelsea (br. Boston) — Union Motor Sales Co., 40 Fourth St. awarded contract for the construction 1 and 2 story, repair shop and garage addition, at 40-42 4th St. Estimated cost $40,000.

Mass., Hyannis—J. H. Connolly, Depot Sq. taking bids for the construction 1 story, garage and repair shop, Center St. Estimated cost $40,000. Private plans.

Mass., Malden—L. M. Fowler, 424 Pleasant St. awarded contract for the construction 1 story, garage and repair shop on Pleasant St. Estimated cost $40,000.

Mass., Waltham — Owner c/o W. H. Haines, Archt., 32 Riverview Ave. having plans prepared for the construction of 1 story, 60x100 ft. garage, showroom and repair shop, on Main St. Estimated cost $50,000.

Minn., Duluth—Union Carbide & Carbon Corp., 30 East 42nd St., New York City, plans the construction of a factory, here. Estimated cost $200,000.

N. Y., Brooklyn — Cummings Laundry Machinery Co., 57 Frost St. having plans prepared for the construction of 1 story, 94x119 ft. factory. Estimated cost $45,000. E. M. Adelson, 26 Court St., Archt.

N. Y., Buffalo—Drop Forge Co., having plans prepared for the construction of 1 story, foundry, here. Estimated cost $75,000. E. McGeorge, 3030 Euclid Ave., Cleveland, O., Archt. and Engr.

N. Y., Maspeth—Ideal Chair Co., 1406 Metropolitan Ave., Brooklyn awarded contract for the construction of 3 story, chair plant, here. Estimated cost $400,000.

N. Y., New York—J. J. Gloster, 1449 Bway., Archt. preparing plans for the construction of 4 story, service and repair garage, at 429-31 West 53rd St. Estimated cost $110,000.

N. Y., New York—Kent Automatic Parking Garage, Inc., 350 Madison Ave. having plans prepared for the construction of 100x200 ft. service, repair and garage building, 209-11 East 44th St. Estimated cost $1,000,000. W. G. Hudson, 50 Church St., Archt.

N. J., Camden—Pub. Serv. Electric & Gas Co., 437 High St. awarded contract for the construction of 1 story, 140 x 150 ft., garage at 17th and Stevens Sts. to Pub. Service Production Co., 80 Park Pl., Newark. Estimated cost $150,000. Noted June 23.

N. J., Linden—Radio Electric Clock Corp., 50 Church St., New York City will build radio factory, etc. here. Estimated cost $55,000. Work will be done by separate contracts. W. Mayer, Jr. and R. E. Gevez, 71 Bergenline Ave., West New York, Archts.

Pa., Lancaster—Bearings Co. of America has work underway on the construction of 3 buildings 40 x 150 ft. and 94 x 100 ft. additions to Sterling Plant and 100 x 130 ft. to main plant.

Pa., Phila.—R. H. Hood Co., awarded contract for the construction of 1 story 48x76 ft. factory addition for manufacture of worsted machinery, at 19th and Westmoreland Sts.

Pa., Phila.—D. J. Keating, 2042 Rittenhouse St. awarded contract for the construction of 1 and 2 story, 63 x 100 ft. shop and office building at 613-23 South 24th St.

Pa., Phila.—S. Yellin, 5520 Arch St. takes bids July 19, for the construction of 2 story, 35x100 ft. metal works shop addition at Allison and Arch Sts. Estimated cost $30,000. Private plans.

O., Cleveland—Carnegie Body and Top Co., E. S. Eckstein, Secy., 6115 Carnegie Ave., had plans prepared for the construction of 1 story, 85 x 92 ft., factory at 6115 Carnegie Ave. Estimated cost $40,000. J. Steffins, Fidelity Bldg., Archt.

Wis., La Crosse—Natl. Gauge & Equipment Co., Caledonia St. awarded contract for the construction of a 1 story, 130x135 ft., factory addition and 2 story 70x160 ft. office building, here.

Ont., Listowel — Clarks Metals Ltd., branch Bassac Co., Bridgeport, Conn. plans remodeling factory here for manufacture of casters and auto parts, etc.

Ont., Oshawa—General Motors of Canada, Ltd., having plans prepared for the construction of 3 story 90x300 ft. addition to body plant, on Division St., here. Estimated cost $250,000. Hutton, Souter, 6 James St. South, Hamilton, Archt.

Ont., Oshawa—General Motors of Canada, Oshawa, awarded contract for the construction of 2 and 3 story, 200 x 450 ft., automobile factory, here. Estimated cost $750,000.

Ont., Port Arthur—E. D. Girardot plans the construction of 2,500 ton capacity smelter for lead and zinc ores, here.

Ont., Sarnia—Vento Steel Window Co., Ltd. subsidiary of Vento Steel Sash Co., Muskegon, Mich. plans remodeling factory on Water St., for manufacture of steel windows. J. J. Gillman, Muskegon, mgr.

B. C., Fernie—Morrissey Michel Railway, plans rebuilding locomotives shops, here recently destroyed by fire. Estimated cost $50,000.